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TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

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TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

111

VOLUME XXVIII.

INCLUDING SESSIONS LXXXIV.–LXXXVII.

(1919-1923.)

WITH NUMEROUS ILLUSTRATIONS.

EDINBURGH:

PRINTED FOR THE BOTANICAL SOCIETY.

1923.

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PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXIV

OCTOBER 3, 1919.

JAMES WHYTOCK, Esq., President, in the Chair.

The following Office-Bearers were elected for Session 1919–1920:—

PRESIDENT.

JAMES WHYTOCK, Esq.

VICE-PRESIDENTS.

A. W. BORTHWICK, O.B.E., D.Sc.
ALEXANDER COWAN, Esq.
JAMES FRASER, Esq.
SYMINGTON GRIEVE, Esq.

COUNCILLORS.

Sir ARCHIBALD BUCHAN-HEPBURN, Bart.
T. BENNET CLARK, C.A.
JAMES GRIEVE, Esq.
J. RUTHERFORD HILL, Esq.
MRS. JOHN LAW.
ISA MARTIN, M.A.
R. STEWART MACDOUGALL, M.A., D.Sc.
R. A. ROBERTSON, M.A., B.Sc.
W. G. SMITH, B.Sc., Ph.D.
MALCOLM WILSON, D.Sc., F.R.S.E., F.L.S.

Honorary Secretary—W. W. SMITH, M.A.
Foreign Secretary—The Very Rev. D. PAUL, M.A., D.D., LL.D.
Treasurer—ANDREW MASON, Esq., c/o RICHARD BROWN & Co., C.A.
Assistant-Secretary—J. T. JOHNSTONE, M.A., B.Sc.
Artist—Professor FRANCIS M. CAIRD, M.B., C.M., F.R.C.S.E.
Auditor—ROBERT C. MILLAR, C.A.

LOCAL SECRETARIES.

Bathgate—ROBERT KIRK, M.D., F.R.C.S.E.
Calcutta—Professor S. C. MAHALANOBIS, B.Sc., F.R.S.E., F.R.M.S., Presidency College.
Cambridge—ARTHUR EVANS, M.A.
Croydon—A. BENNETT, A.L.S.
East Liss, Hants—JAMES SYKES GAMBLE, M.A., C.I.E., F.R.S.
Glasgow—Professor F. O. BOWER, Sc.D., F.R.S., F.L.S.
London—WILLIAM CARRUTHERS, F.R.S., F.L.S.
„ J. F. DUTHIE, B.A., F.L.S.
„ E. M. HOLMES, F.L.S., F.R.H.S.
„ Lieut.-Col. Sir DAVID PRAIN, M.D., C.I.E., F.R.S., F.L.S., Royal Botanic Gardens, Kew.
Philadelphia, U.S.A.—Professor J. M. MACFARLANE, D.Sc., F.R.S.E.
St. Andrews—Professor M'INTOSH, M.D., LL.D., F.R.S.E.
„ ROBERT A. ROBERTSON, M.A., B.Sc.
„ J. H. WILSON, D.Sc., F.R.S.E.
Toronto, Ontario—The Hon. W. R. RIDDELL, B.Sc., B.A., LL.D.
„ Professor RAMSAY WRIGHT, M.A., B.Sc.

The PRESIDENT intimated the death since last meeting of Professor WILLIAM GILSON FARLOW, an Honorary Foreign Fellow, of Professor J. W. H. TRAIL, a former President of the Society, and also of GEORGE BIRD, a Resident Fellow and former Office-Bearer.

Mr. SYMINGTON GRIEVE made a statement on the threatened destruction of rare plants at Blackford Hill by the County Road Board removing for road metal the rock on which they grow. On his motion a resolution of protest was carried unanimously, and a copy ordered to be sent to the Town Council.

Captain W. BALFOUR GOURLAY communicated Notes from Cannock Chase on *Vaccinium intermedium*, Ruthe, specimens of the hybrid and parent plants being shown (see vol. xxvii, p. 327).

The Hon. W. R. RIDDELL communicated a paper on the Pharmacopoeia of another Botanical Physician (see p. 1).

Dr. R. S. MACDOUGALL read a paper on *Perrisia laricis* as an enemy of Larch cones, the attacks being destructive to seed.

Dr. R. S. MACDOUGALL exhibited *Stephanitis Rhododendri*, a Tingid injurious to Rhododendron leaves, and also *Scolytus intricatus*, causing damage to an oak stem.

Dr. MALCOLM WILSON exhibited specimens of the aecidial stage of *Cronartium ribicola*, Dietr. (*Peridermium Strobi*, Kleb.), on *Pinus Lambertiana*, Dougl., from Murthly, Perthshire. This is the first record of the fungus on this host for Great Britain.

Mr. H. F. TAGG exhibited cultures of *Penicillium* showing zonation, and read some preliminary notes on them.

NOVEMBER 10, 1919.

JAMES WHYTOCK, Esq., President, in the Chair.

Mr. JAMES TEMPLETON, Mr. ROBERT J. PEALLING, and Mr. FERGUSON HAMILTON were elected Resident Fellows.

Mr. R. M. ADAM read a paper on Vegetation Records by Aerial Photography, in which an outline of the methods and apparatus employed was illustrated and described, and by a series of slides and descriptions the marked character of vegetation as seen from the air was shown, and the value of an aerial photograph as a means to record the vegetation was demonstrated. Attention was directed to the value of aerial photography to the forester, and the information obtainable from the air was discussed, photographs of woodland from the air being shown. Reference was made to its use in botanical survey, also its value when prospecting for timber over forest areas. Several large photographic maps of agricultural landscapes were exhibited, the slides shown being all of areas in Scotland, and two especially were notable, one of Lochnagar and the other of Glen Doll.

DECEMBER 11, 1919.

JAMES WHYTOCK, Esq., President, in the Chair.

Miss D. G. DOWNIE was elected a Resident Fellow.

The PRESIDENT intimated the death of the Rev. E. S. MARSHALL, an Honorary British Fellow of the Society.

Professor O. L. RICHMOND read a paper on the Floral Decoration on the Friezes of a Roman Altar of Peace, and

illustrated it with a large number of lantern illustrations with the object of identifying the plants which had served the artist for models. Many of the plants were too conventional for identification, but others could be referred to particular genera with some certainty.

Miss IDA M. HAYWARD read "Notes on the Adventive Flora of the Tweed," in which she dealt with aliens introduced through the woollen industry, and also exhibited a large number of specimens.

Dr. A. W. BORTHWICK exhibited specimens of *Cæoma pinitorquum* on the Scots Pine, and also of Douglas Fir twigs damaged by an insect.

Mr. J. M. MURRAY sent for exhibition specimens of Scots Pine, showing variations indicating the existence of "races" of the species, and also specimens of malformation of hazel catkin.

JANUARY 22, 1920.

JAMES WHYTOCK, Esq., President, in the Chair.

The TREASURER, Mr. ANDREW MASON, submitted the following Statement of Accounts for Session 1918–1919:—

INCOME.

Annual Subscriptions for 1918–1919	£26	15	0
Do. Arrears	5	10	0
Transfer from Life Members' Fund	10	13	2
Transactions sold	4	5	0
Diploma	0	5	0
Interest on Funds Invested and in Bank	8	1	1
Subscriptions to Illustration Fund	3	10	0
	£58	19	3

EXPENDITURE

Printing *Transactions* for 1918–1919	£55	19	6
Printing Notices for Meetings, etc.	8	3	6
Rooms for Meetings and Tea	4	1	0
Stationery, Postages, Carriages, etc.	3	8	10
Fire Insurance on Books, etc.	0	5	0
Honorarium to Secretary's Assistant	2	2	0
Do. to Treasurer	4	4	0
	£78	3	10
Excess of Expenditure over Income	£19	4	7

State of Funds.

Life Members' Fund.

Balance of Fund at close of Session 1917–1918 . .				£107	3	6
Add—Life compositions received				32	11	0
				£139	14	6
Deduct—Transferred to Income				10	13	2
Balance as at close of Session . .				£129	1	4

Ordinary Fund.

Balance of Fund at close of Session 1917–1918	£69	5	3			
Deduct—Decrease during Session 1918–1919	19	4	7			
Balance as at close of Session . .				50	0	8
Total Funds . .				£179	2	0

Being:—£100 5% War Stock, 1929–1947	£95	0	0			
Sum in Current Account with Union Bank of Scotland, Ltd. .	21	5	0			
Sum in Deposit Receipt with do.	130	0	0			
	£246	5	0			
Less—Net Balance on outstanding Accounts . £64 3 0						
Due to Treasurer 3 0 0	67	3	0			
As above .				£179	2	0

Note.—Subscriptions in arrear, considered recoverable: 1917–18, £2, 5s.; 1918–19, £4, 10s.

Edinburgh, 10*th January* 1920.—I hereby certify that I have audited the Accounts of the Treasurer of the Botanical Society of Edinburgh for Session 1918–1919, and have found them correct. I have also checked the foregoing Abstract, and find it correct.

Robt. C. Millar, C.A., *Auditor.*

The President announced the death of Sir Thomas R. Fraser, and of John H. Wilson, D.Sc., both Resident Fellows and former Office-Bearers.

Dr. A. W. Borthwick read a paper on "Roads of Remembrance," and the Planting of Ornamental and Memorial Trees.

Dr. R. S. MacDougall read a Note on *Empusa* sp. as destructive to *Rhopalosiphum dianthi*, and also on *Pseudo-*

coccus gahani as an enemy of *Cereus viridiflorus*, and exhibited specimens of both.

Dr. MALCOLM WILSON exhibited a specimen of *Melasmia Empetri*, Magn., on *Empetrum nigrum*, Linn., collected on Creag na Caillich, Killin. There is little doubt that *Rhytisma Empetri*, Buchanan White, is identical with this species. Examination shows that no asci are present in Buchanan White's specimens, which were assigned to *Rhytisma* probably only on account of their external resemblance to that genus.

Mr. W. W. SMITH and Dr. J. SMALL exhibited a specimen of *Paraseneciо*, a new genus of Compositae.

Mr. N. M. JOHNSON sent for exhibition sections of an abnormal ovary of Tulip.

FEBRUARY 19, 1920.

JAMES WHYTOCK, Esq., President, in the Chair.

Professor J. W. BEWS read a paper on the Vegetation of South Africa, in which he described the various vegetation regions of South Africa, and explained the different climatic and other factors which determine the nature of the vegetation. The paper was illustrated by a fine series of lantern slides, which were arranged to show the plant succession in the different regions, beginning with the semi-desert Karroo and central portion of South Africa. Natal and the Eastern side of South Africa were dealt with in detail. Economic questions were also touched upon and illustrated.

MARCH 18, 1920.

JAMES WHYTOCK, Esq., President, in the Chair.

Mr. ANDREW HOWISON was elected a Resident Fellow.

Professor BAYLEY BALFOUR communicated a paper on *Primula tapeina*, Balf. f. et Forrest, and some other Dwarf Suffruticose Primulas in Cultivation.

Dr. W. G. SMITH communicated a paper on Some Oat Hybrids, which dealt with hybrids between the Chinese and Hungarian Oat, and specimens of the various crosses were exhibited.

Dr. MALCOLM WILSON exhibited two new Fungi, *Labridium Rhododendri* and *Aecidium sino-Rhododendri*, on *Rhododendron calvescens*, Balf. f. et Forrest, collected by Mr. George Forrest in Tibet.

APRIL 8, 1920.

JAMES WHYTOCK, Esq., President, in the Chair.

Dr. B. D. MACCALLUM was elected a Non-Resident Fellow.

Dr. A. W. BORTHWICK showed a series of lantern slides on Forestry, and read a descriptive lecture as an example of a series which might be formed to aid in Forestry education, and invited criticism on the project. A discussion followed which was generally favourable to the scheme.

A large collection of Rhododendrons in flower were shown from the Royal Botanic Garden. The species exhibited were:—

R. Anthopogon, D. Don; *R. arboreum*, Sm.; *R. argenteum*, Hook. f.; *R. aeruginosum*, Hook. f.; *R. Augustinii*, Hemsl.; *R. Baileyi*, Balf. f.; *R. Benthamianum*, Hemsl.; *R. campanulatum*, D. Don; *R. campylocarpum*, Hook. f.; *R. charianthum*, Hutchinson; *R. chartophyllum*, Franch.; *R. ciliatum*, Hook. f.; *R. cuneatum*, W. W. Sm.; *R. Davidsonianum*, Rehd. et Wils.; *R. decorum*, Franch.; *R. fastigiatum*, Franch.; *R. flavidum*, Franch.; *R. fulgens*, Hook. f.; *R. glaucum*, Hook. f.; *R. haematochilum*, Craib; *R. hedyosmum*, Balf. f.; *R. hippophaeoides*, Balf. f. et W. W. Sm.; *R. Hodgsoni*, Hook. f.; *R. impeditum*, Balf. f. et W. W. Sm.; *R. intricatum*, Franch.; *R. Keiskei*, Miq.; *R. Kaempferi*, Planch.; *R. ledifolium*, G. Don; *R. lochmium*, Balf. f.; *R. longistylum*, Rehd. et Wils.; *R. lutescens*,

Franch.; *R. Metternichii*, Sieb. et Zucc.; *R. neriiflorum*, Franch.; *R. nivale*, Hook. f.; *R. oleifolium*, Franch.; *R. oreotrephes*, W. W. Sm.; *R. pendulum*, Hook. f.; *R. pseudo-yanthinum*, Balf. f.; *R. racemosum*, Franch.; *R. rhombicum*, Miq.; *R. rubiginosum*, Franch.; *R. scabrifolium*, Franch.; *R. scintillans*, Balf. f. et W. W. Sm.; *R. Searsiae*, Rehd. et Wils.; *R. serpyllifolium*, Miq.; *R. setosum*, D. Don; *R. sino-grande*, Balf. f. et W. W. Sm.; *R. Smithii*, Nutt.; *R. stereophyllum*, Balf. f. et W. W. Sm.; *R. sycnanthum*, Balf. f. et W. W. Sm.; *R. Thomsoni*, Hook. f.; *R. thyodocum*, Balf. f. et Cooper; *R. Valentinianum*, G. Forrest; *R. Veitchianum*, Hook.; *R. virgatum*, Hook. f.; *R. Wallichii*, Hook. f.; *R. yunnanense*, Franch.

MAY 13, 1920.

JAMES WHYTOCK, Esq., President, in the Chair.

The PRESIDENT announced the death of WILLIAM BEAVERLEY COWIE, F.C.S., a Resident Fellow.

Mr. WILLIAM YOUNG read a paper on Preliminary Notes for a Flora of Fife and Kinross, in which he indicated what had already been done in that field, and outlined his scheme for a complete flora of the two counties, and he appealed for assistance in carrying out the work.

Mr. M. Y. ORR exhibited abnormal Catkins of *Salix Medemii*, Boiss., from the Royal Botanic Garden.

JUNE 10, 1920.

JAMES WHYTOCK, Esq., President, in the Chair.

The PRESIDENT intimated the death of Professor TIMIRIAZEFF, an Honorary Foreign Fellow, and of Mrs. A. DOWELL, a Resident Fellow.

Colonel H. H. JOHNSTON communicated three papers: Additions to the Flora of Orkney as recorded in Watson's Topographical Botany, ed. 2 (see p. 23); Corrections to

"Notice of some of the Rarer Plants observed in Orkney during the Summer of 1849, by John T. Syme" (see p. 46); and Observations on "Notes on the Flora of the Orkney Isles, by Arthur Bennett, A.L.S." (see p. 43). A large number of rare and interesting plants from Orkney were also exhibited.

Dr. MALCOLM WILSON exhibited specimens of Douglas Fir attacked by a species of *Phomopsis* (see p. 47), and also specimens of *Sirex gigas* and its Ichneumon, *Rhyssa persuasoria*, Linn., attacked by a species of *Isaria* closely resembling *Isaria floccosa*, Fr., which has been found on *Bombyx Jacobaea* in Britain.

PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXV

OCTOBER 21, 1920.

JAMES WHYTOCK, Esq., President, in the Chair.

The following Office-Bearers were elected for Session 1920–1921 :—

PRESIDENT.

W. G. SMITH, B.Sc., Ph.D.

VICE-PRESIDENTS.

A. W. BORTHWICK, O.B.E., D.Sc.
JAMES FRASER, Esq.
J. RUTHERFORD HILL, Esq.
MALCOLM WILSON, D.Sc., F.L.S., F.R.S.E.

COUNCILLORS.

Sir ARCHIBALD BUCHAN-HEPBURN, Bart.
T. BENNET CLARK, C.A.
SYMINGTON GRIEVE, Esq.
Col. H. H. JOHNSTON, C.B., C.B.E., F.L.S.
Mrs. JOHN LAW.
ISA MARTIN, M.A.
R. STEWART MACDOUGALL, M.A., D.Sc.
Sir JOHN STIRLING MAXWELL, Bart.
R. A. ROBERTSON, M.A., B.Sc.
JAMES WHYTOCK, Esq.

Honorary Secretary—W. W. SMITH, M.A., F.R.S.E.
Foreign Secretary—Very Rev. D. PAUL, M.A., D.D., LL.D.
Treasurer—ANDREW MASON, Esq., c/o RICHARD BROWN & Co., C.A.
Assistant-Secretary—J. T. JOHNSTONE, M.A., B.Sc.
Artist—Professor FRANCIS M. CAIRD, M.B., C.M., F.R.C.S.E.
Auditor—ROBERT C. MILLAR, C.A.

LOCAL SECRETARIES.

Aberdeen—Professor W. G. Craib, M.A.
Calcutta—Professor S. C. Mahalanobis, B.Sc., F.R.S.E., F.R.M.S., Presidency College.
Cambridge—Arthur Evans, M.A.
Croydon—A. Bennett, A.L.S.
East Liss, Hants—James Sykes Gamble, M.A., C.I.E., F.R.S.
Glasgow—Professor F. O. Bower, Sc.D., F.R.S., F.L.S.
London—William Carruthers, F.R.S., F.L.S.
„ J. F. Duthie, B.A., F.L.S.
„ E. M. Holmes, F.L.S., F.R.H.S.
„ Lieut.-Col. Sir David Prain, M.D., C.I.E., F.R.S., F.L.S., Royal Botanic Gardens, Kew.
Philadelphia, U.S.A.—Professor J. M. Macfarlane, D.Sc., F.R.S.E.
St. Andrews—Professor M'Intosh, M.D., LL.D., F.R.S.E.
„ Robert A. Robertson, M.A., B.Sc.
Toronto, Ontario—The Hon. W. R. Riddell, B.Sc., B.A., LL.D.

Mr. R. Angus Galloway was elected a Resident Fellow.

The President intimated the death since last meeting of John Gilbert Baker, F.R.S., an Honorary British Fellow, and of Robert Kirk, M.D., a Resident Fellow.

Dr. Malcolm Wilson read a paper on Two Diseases of the Douglas Fir, in which a new fungus, *Phomopsis Pseudotsugae*, was described (see p. 47), and *Botrytis Douglasii* was recorded on the Douglas fir for the first time in this country.

Dr. Malcolm Wilson and Mr. H. F. Tagg communicated a paper on *Physarum gyrosum* in Britain.

Dr. W. G. Smith exhibited specimens of a new Black-currant-Gooseberry hybrid which differed from previously described hybrids of similar parentage.

Mr. T. Bennet Clark exhibited specimens of the so-called Strawberry-Raspberry (*Rubus sorbifolius*, Hort.), of which other specimens were also shown by Mr. James Fraser.

Mr. James Fraser exhibited specimens of Ergot on *Alopecurus alpinus*, Sm., var. *robustus*, Druce, from Tweedside. Ergot on other grasses was also shown by Dr. W. G. Smith.

The following plants in flower were shown from the Royal Botanic Garden:—*Cirrhopetalum Farreri*, W. W. Sm.; *Columnea gloriosa*, Sprague: *Sedum pyramidale*, Praeger; *Spathoglottis Edinensis*, Hort. Edin. (S. pulchra × Fortunei); *Spathoglottis pulchra*, Schlechter; *Spathoglottis Fortunei*, Lindl.

NOVEMBER 18, 1920.

W. G. Smith, B.Sc., Ph.D., President, in the Chair.

Mr. M. Y. Orr read a Preliminary Paper on Bacterial Pockets in the Leaf of a species of *Dioscorea* from Nigeria, and exhibited specimens and cultures of the Bacterium in various media.

Dr. B. D. MacCallum exhibited specimens of coniferous wood infected with Blue Rot, the disease being caused by *Ceratostomella sp.* Other specimens of timber similarly discoloured by another fungus were shown by Dr. W. G. Smith.

Mr. J. R. Matthews exhibited a land form of *Utricularia vulgaris*, Linn., which is robuster than the type and has no bladders.

Mr. William Evans exhibited some original Drawings of Scottish Scenery by Dr. R. K. Greville, the author of Scottish Cryptogamic Botany, and a former President of the Society.

The following plants in flower were shown from the Royal Botanic Garden:—*Burbidgea nitida*, Hook. f.; *Enadenia eminens*, Hook. f.; *Gentiana rhodantha*, Franch.; *Primula Mooreana*, Craib; *Sophro-Cattleya eximea* ×; *Theophrasta Jussieui*, Lindl.

DECEMBER 16, 1920.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

The TREASURER, Mr. ANDREW MASON, submitted the following Statement of Accounts for Session 1919–1920:—

INCOME.

Annual Subscriptions for 1919–1920	£30 10 0
Do. Arrears	4 10 0
Transfer from Life Members' Fund	10 16 4
Transactions sold	6 5 0
Interest on Funds Invested and in Bank	9 16 8
Subscriptions to Illustration Fund	2 1 0
	£63 19 0

EXPENDITURE.

Printing *Transactions* for 1919–1920	£51 8 5
Printing Notices for Meetings, etc.	18 5 0
Rooms for Meetings and Tea	10 6 6
Hire of Lantern	4 0 10
Stationery, Postages, Carriages, etc.	2 17 3
Fire Insurance on Books, etc.	0 5 0
Honorarium to Treasurer	4 4 0
	£91 7 0
Excess of Expenditure over Income	£27 8 0

STATE OF FUNDS.

Life Members' Fund.

Balance of Fund at close of Session 1918–1919		£129 1 4
Add—Life compositions received		9 9 0
		£138 10 4
Deduct—Transferred to Income		10 16 4
Balance as at close of Session		£127 14 0

Ordinary Fund.

Balance of Fund at close of Session 1918–1919	£50 0 8	
Deduct—Decrease during Session 1919–1920	27 8 0	
Balance as at close of Session		22 12 8
Total Funds		£150 6 8

Being:—£100 5% War Stock, 1929–1947				£95	0	0			
Sum in Current Account with Union Bank of Scotland, Ltd. .				27	10	1			
Sum in Deposit Receipt with do.				100	0	0			
				£222	10	1			
Less—Accounts unpaid	£69	13	5						
Due to Treasurer	2	10	0						
				72	3	5			
				As above .			£150	6	8

Note.—Subscriptions in arrear, considered recoverable: 1917–18, 15s.; 1918–19, £1, 10s.; 1919–20, £3, 15s.

EDINBURGH, 7*th December* 1920.—I hereby certify that I have audited the Accounts of the Treasurer of the Botanical Society of Edinburgh for Session 1919–1920, and have found them correct. I have also checked the foregoing Abstract, and find it correct.

ROBT. C. MILLAR, C.A., *Auditor.*

Mr. JOHN GARRIOCK was elected a non-Resident Fellow.

Dr. W. G. SMITH read a communication on a Vegetation Survey of the Moorfoots in which he described the various vegetation units of the district, using a large scale map and many photographs as illustrations. The survey was partly the work of the late Donald Macpherson, and had been undertaken to correlate the sheep value of the various hirsels with the different types of pasturage.

Mr. ARTHUR BENNETT communicated a paper on *Pyrola rotundifolia*, Linn., in Caithness, with notes on the genus (see p. 71), and also a note on *Vaccinium Myrtillus*, Linn., var. *pygmaeus*, Ostenfeld. f. *microphylla*, Lange (see p. 75).

Mr. H. F. TAGG exhibited some specimens of Ash twigs damaged by insect attacks.

Dr. A. W. BORTHWICK showed samples of German war-time string made from paper.

The following plants in flower were shown from the Royal Botanic Garden:—*Aberonia myosurus*, Lindl.; *Angraecum distichum*, Lindl.; *Bulbophyllum lemniscatum*, Parish; *Bulbophyllum papillosum*, J. J. Sm.; *Cirrhopetalum guttulatum*, Hook. f.; *Octomeria grandiflora*, Lindl.; *Porpax Meirax*, King et Prantl; *Stelis alba*, H. B. et K.

JANUARY 20, 1921.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

The PRESIDENT intimated the death, on the previous day, of Dr DAVID YELLOWLEES, a non-Resident Fellow.

Mr. A. GUTHRIE SMITH read a paper on The Immigration of Weeds from the Coast in New Zealand, in which he gave some results of his observations since 1882 on the alien weed flora of his farm and surrounding country near Hawke Bay, each stage of the development of the land being marked by its particular species, and he described some of the many methods by which the alien weeds were introduced and spread over the country.

Mr. WILLIAM EVANS read a paper on Some Moss Records from St. Kilda (see p. 67).

Dr. MALCOLM WILSON exhibited specimens of Spruce Canker caused by *Dasycypha calyciformis*, Willd., the first time recorded for Britain.

The following plants in flower were shown from the Royal Botanic Garden:—*Bulbophyllum comosum*, Hemsl.; *Epidendrum polybulbon*, Sw.; *Masdevallia Schlimii*, Linden; *Maxillaria lepidota*, Lindl.; *Maxillaria Mooreana*, Rolfe; *Pleione yunnanensis*, Rolfe.

FEBRUARY 17, 1921.

JAMES FRASER, Esq., Vice-President, in the Chair.

Mr. W. W. SMITH and Mr. W. E. EVANS communicated a description of a new genus of Sterculiaceae, named *Craigia*, in honour of Dr. Wm. Craig, a past President of the Society (see p. 69). Specimens of the type species *Craigia yunnanensis* were also shown.

Dr. R. S. MACDOUGALL read a paper on Furniture Beetles, their life-history and how to fight them, in which he gave an interesting account of *Anobium domesticum* and other species which attack and destroy furniture, and showed many specimens of the damage done by them, including some of the damaged wood from Westminster Hall. He also discussed the various methods of killing the beetles and of preserving wood against their attacks.

Dr. MALCOLM WILSON exhibited specimens of *Pinus austriaca* and *P. montana* attacked by *Brunchorstia distruens*, which had been obtained near Peebles. This is the first time this fungus has been recorded in Britain.

Living plants of the following species of *Mesembryanthemum* were shown from the Royal Botanic Garden:—*M. bilobum*, Marloth; *M. Bolusii*, Hook. f.; *M. Elishae*, N. E. Br.; *M. Lesliei*, N. E. Br.; *M. Nevillei*, N. E. Br.; *M. obcordellum*, Haw.; *M. Pearsoni*, N. E. Br.; *M. pictum*, N. E. Br.; *M. pseudotruncatellum*, A. Berger; *M. testiculatum*, Jacq.; *M. truncatellum*, Haw.

MARCH 17, 1921.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

Colonel H. H. JOHNSTON read two papers, Additions to the Flora of Orkney as recorded in Watson's Topographical Botany, 2nd Ed. (see p. 51), and Notes on Some Rare or Interesting Orkney Plants. These he illustrated by a large number of specimens collected by himself in Orkney.

Dr. W. G. SMITH exhibited a number of potatoes raised from seed.

The following plants in flower were shown from the Royal Botanic Garden:—*Corydalis Alleni*, Hort.; *Daphne Blagayana*, Freyer; *Daphne pontica*, Linn.; *Morisia hypogaea*, J. Gay; *Oresitrophe rupifraga*, Bunge; *Prostanthera rotundifolia*, R. Br.; *Shortia uniflora*, Maxim.; *Vaccinium hirsutum*, Buckl.; *Wulfenia cordata*, Greene.

APRIL 21, 1921.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

Mr. JOHN SUTHERLAND was elected a Resident Fellow.

Dr. J. MACLEAN THOMPSON was elected a non-Resident Fellow.

The PRESIDENT announced the death, on 11th March, of Mr. J. R. DRUMMOND, a non-Resident Fellow.

Mr. GLODE GUYER read a paper on the Cultivation of Medicinal Plants in Scotland—Past and Present, in which he detailed the history of the foundation of the Physic Gardens in Edinburgh, by Robert Sibbald and Andrew Balfour, and their development into the present Royal Botanic Garden. He also described the garden commenced by Duncan, Flockhart & Co. at Warriston, and many of the medicinal plants grown there. The paper was illustrated by a large number of lantern slides, by a series of enlarged photographs, and by a number of the herbs both fresh and in the dried state.

MAY 19, 1921.

T. CUTHBERT DAY, Esq., in the Chair.

Mr. J. MONTAGU F. DRUMMOND was elected a Resident Fellow.

Miss GERTRUDE JARDINE was elected an Ordinary Member.

The CHAIRMAN announced the death of Dr. HENRY BARNES, a non-Resident Fellow.

Mr. WILLIAM EVANS read a paper on Scottish Humble Bees, in which he gave an account of the species of *Bombus* and *Psithyrus* which occur in Scotland, and suggested as an interesting study the noting of the species of bee which visit introduced plants. He also exhibited specimens of the various species.

JUNE 16, 1921.

JAMES WHYTOCK, Esq., in the Chair.

Mr. JAMES TEMPLETON read a paper on the Effect of late Frost on Wood of *Acer*, and showed sections of a tree recently cut which had fractured on drying, the flaws being evidently due to the exceptional frost of 1897.

Dr. MALCOLM WILSON exhibited specimens of Douglas Fir on which wounds caused by *Phomopsis* had begun to heal, the cambium having been killed on a part only of the circumference.

PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXVI

OCTOBER 20, 1921.

W. G. Smith, B.Sc., Ph.D., President, in the Chair.

The following Office-Bearers were elected for Session 1921–1922:—

PRESIDENT.

W. G. Smith, B.Sc., Ph.D.

VICE-PRESIDENTS.

T. Bennet Clark, C.A.
R. Stewart MacDougall, M.A., D.Sc.
J. Rutherford Hill, Esq.
Malcolm Wilson, D.Sc., F.L.S., F.R.S.E.

COUNCILLORS.

A. W. Borthwick, O.B.E., D.Sc.
James Fraser, Esq.
Symington Grieve, Esq.
Andrew Howison, M.A., B.Sc.
Col. H. H. Johnston, C.B., C.B.E., F.L.S.
Mrs. John Law.
Isa Martin, M.A.
Sir John Stirling Maxwell, Bart.
R. A. Robertson, M.A., B.Sc.
James Whytock, Esq.

Honorary Secretary—W. W. Smith, M.A., F.R.S.E.
Foreign Secretary—Very Rev. D. Paul, M.A., D.D., LL.D.
Treasurer—Andrew Mason, Esq., c/o Richard Brown & Co., C.A.
Assistant-Secretary—J. T. Johnstone, M.A., B.Sc.
Artist—Professor Francis M. Caird, M.B., C.M., F.R.C.S.E.
Auditor—Robert C. Millar, C.A.

LOCAL SECRETARIES.

Aberdeen—Professor W. G. Craib, M.A.
Calcutta—Professor S. C. Mahalanobis, B.Sc., F.R.S.E., F.R.M.S., Presidency College.
Cambridge—Arthur Evans, M.A.
Croydon—A. Bennett, A.L.S.
East Liss, Hants—James Sykes Gamble, M.A., C.I.E., F.R.S.
Glasgow—Professor F. O. Bower, Sc.D., F.R.S., F.L.S.
London—William Carruthers, F.R.S., F.L.S.
„ J. F. Duthie, B.A., F.L.S.
„ E. M. Holmes, F.L.S., F.R.H.S.
„ Lieut.-Col. Sir David Prain, M.D., C.I.E., F.R.S., F.L.S., Royal Botanic Gardens, Kew.
Philadelphia, U.S.A.—Professor J. M. Macfarlane, D.Sc., F.R.S.E.
St. Andrews—Professor M'Intosh, M.D., LL.D., F.R.S.E.
„ Robert A. Robertson, M.A., B.Sc.
Toronto, Ontario—The Hon. W. R. Riddell, B.Sc., B.A., LL.D.

Miss Isabella M. King was elected a Resident Fellow.

Dr. W. G. Smith delivered his Presidential Address (see p. 77).

Mr. James Fraser exhibited specimens of *Sieglingia decumbens*, Bernh., showing basal florets which produced seed. A number of points were raised in the subsequent discussion, such as the value of these florets to the plant, which showed the need for further observation and research.

Dr. Malcolm Wilson exhibited specimens of Potato attacked by *Armillaria mellea* (*Vahl*) *Quel.*, collected in the neighbourhood of Edinburgh. This fungus has not been previously described as a potato disease in Europe, although recorded from Australia and Japan.

A number of plants in flower were shown from the Royal Botanic Garden.

NOVEMBER 17, 1921.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

Miss ESME DALMAHOY was elected an Ordinary Member.

Miss MARION WALKER, Miss JANET WATT, Dr. R. J. D. GRAHAM, Mr. JOHN F. V. PHILLIPS, and Mr. ERNEST V. LAING were elected Resident Fellows.

Mr. T. BENNET CLARK read a note on a Seedling of *Cytisus Adami*, Poit. (see p. 84), and exhibited specimens of the leaves and photographs of the seedling.

Mr. W. E. EVANS communicated a paper by Dr. E. J. SALISBURY on *Salicornia dolichostachya*, Moss, in Scotland (see p. 87).

Mr. W. E. EVANS exhibited a series of specimens of *Salicornia* from the Lothians to illustrate the preceding paper.

Dr. W. G. SMITH read a paper on *Spartina Townsendii* in the Forth, the plant having been introduced between Kincardine-on-Forth and Carriden in 1914. It has flowered there but not fruited, and it is not spreading.

The Hon. W. R. RIDDELL communicated a paper on a Preacher-Physician's Pharmacopœia, dealing with *Steward's Healing Art*, published at Saco, Maine, in 1827.

On behalf of Mr. ARTHUR BENNETT a paper was read, Notes on Pinguicula (see p. 87).

The following plants in flower were shown from the Royal Botanic Garden:—*Anthocercis viscosa*, R. Br.; *Coleus Rehneltianus*, Hort.; *Cuscuta reflexa*, Roxb.; *Nemophila integrifolia*, Abrams; and *Rhododendron linearifolium*, Sieb. et Zucc.

DECEMBER 15, 1921.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

The TREASURER, Mr. ANDREW MASON, submitted the following Statement of Accounts for Session 1920–1921:—

INCOME.

Annual Subscriptions for 1920–1921	£29 5 0
Do. Arrears	3 0 0
Transfer from Life Members' Fund	12 3 7
Transactions sold	4 5 0
Interest on Funds Invested and in Bank	9 3 4
Subscriptions to Illustration Fund	2 5 0
	£60 1 11

EXPENDITURE.

Printing Notices for Meetings, etc.	£23 14 0
Rooms for Meetings and Tea	11 10 0
Stationery, Postages, Carriages, etc.	5 6 1
Fire Insurance on Books, etc.	0 5 0
Honorarium to Treasurer	3 3 0
	£43 18 1
Excess of Income over Expenditure	£16 3 10

STATE OF FUNDS.

Life Members' Fund.

Balance of Fund at close of Session 1919–1920		£127 14 0
Add—Life compositions received		29 8 0
		£157 2 0
Deduct—Transferred to Income		12 3 7
Balance as at close of Session		£144 18 5

Ordinary Fund.

Balance of Fund at close of Session 1919–1920	£22 12 8	
Add—Increase during Session 1920–1921	16 3 10	
Balance as at close of Session, subject to expense of printing *Transactions*		38 16 6
Total Funds		£183 14 11

Being :—£100 5% War Stock, 1929–1947		£95 0 0	
Sum in Current Account with Union Bank of Scotland, Ltd. .		11 7 5	
Sum in Deposit Receipt with do.		100 0 0	
		£206 7 5	
Less—Account unpaid .	£20 17 6		
Subscriptions received in advance	1 15 0		
		22 12 6	
		As above .	£183 14 11

Note.—Subscriptions in arrear, considered recoverable: 1919–20, 15s.; 1920–21, £3, 15s.

EDINBURGH, 7*th December* 1921.—I hereby certify that I have audited the Accounts of the Treasurer of the Botanical Society of Edinburgh for Session 1920–1921, and have found them correct. I have also checked the foregoing Abstract, and find it correct.

ROBT. C. MILLAR, C.A., *Auditor.*

Mr. CHARLES S. S. JOHNSTON and Mr. R. GLODE GUYER were elected Resident Fellows.

Dr. W. BURNS was elected a non-Resident Fellow.

Dr. W. BURNS read a paper on the Ecology of Western India, treating mainly of the desert flora and especially with the presence of salt and its effect on vegetation, with sand and sand-binders, with the vegetation in canals and the conditions favouring it, and also with the population of desert areas. The paper was illustrated by a series of lantern slides.

Dr. W. BALFOUR GOURLAY exhibited some specimens from a volcano in Java and from the Grand Canyon in California.

JANUARY 19, 1922.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

Rev. J. R. S. WILSON and Miss HELEN I. ALLAN GRAY were elected Resident Fellows.

Mr. W. W. SMITH and Professor JAMES SMALL communicated the description of a new Genus of *Compositae*, *Formania* (see p. 91), and exhibited a specimen of *Formania mekongensis*, the type of the genus.

Mr. E. M. BUCHANAN exhibited a large series of photographs from the Burmese forests and from the Andaman Islands and made interesting remarks on the forest flora.

The following plants in flower were shown from the Royal Botanic Garden:—*Acacia Jonesii*, F. Muell. et J. H. Maiden; *Crassula perfoliata*, Linn.; *Crassula recurva*, N. E. Br.; *Daphne Genkwa*, Sieb. et Zucc.; *Osteomeles anthyllidifolia*, Lindl.; *Pelargonium flavum*, Soland.; *Phylica paniculata*, Willd.

FEBRUARY 16, 1922.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

The PRESIDENT announced the death on 3rd February of Dr. WILLIAM CRAIG, who had been a Resident Fellow since 1866. He had held the office of President from 1887–1889 and that of Hon. Secretary from 1900–1912, and had contributed many papers to the Transactions of the Society.

On behalf of Mr. G. F. SCOTT ELLIOT there was read a note on the Occurrence of *Alchemilla conjuncta*, Bab., in Dumfriesshire (see p. 97).

Mrs. C. NORMAN KEMP read a paper, Notes on the Application of X-rays to Botanical Research, in which she gave a summary of the work already done both where their power of affecting photographic plates were taken advantage of and also where their power of affecting living tissue was used, and possible applications to botanical research were indicated. The paper was illustrated by a number of lantern slides.

MARCH 16, 1922.

J. RUTHERFORD HILL, Esq., Vice-President, in the Chair.

Mr. DAVID MONCUR was elected a Resident Fellow.

The CHAIRMAN announced the death on 23rd February of Mr. J. F. DUTHIE, who had been a non-Resident Fellow since 1869.

Dr. MALCOLM WILSON read a paper on the Occurrence of Perithecia of the Oak Mildew, in which he described the morphology and distribution of the oak mildew, *Microsphaera alni*, var. *extensa*, Salm. The occurrence of perithecia on *Quercus conferta* from Macedonia was recorded.

Mr. J. A. ALEXANDER communicated a paper on Palms and their Produce, which was illustrated by a series of photographs.

Mr. W. E. EVANS exhibited on behalf of Mr. JAMES FRASER and himself some alien plants from the Lothians—being *Ranunculi* of the section *Echinella*, and explained that this was the first of what they hoped would be a considerable series of local aliens which would form the basis of a paper on the subject later.

Mr. W. E. EVANS exhibited *Centaurea obscura*, Jord., *forma*, from the Pentlands, collected by Miss Roper in September 1921.

The following plants in flower were shown from the Royal Botanic Garden:—*Coelogyne Delavayi*, Rolfe; *C. yunnanensis*, Rolfe; *Hesperochiron californicus*, S. Wats.; *Oresitrophe rupifraga*, Bunge; *Primula Dubernardiana*, G. Forrest; *P. Fortunei*, Vatke; *P. Knuthiana*, Pax; and *Rhododendron spinuliferum*, Franch.

APRIL 20, 1922.

JAMES WHYTOCK, Esq., in the Chair.

Colonel H. H. JOHNSTON communicated a paper on Additions to the Flora of Orkney, as recorded in Watson's Topographical Botany, 2nd ed., 1883 (see p. 98). This was illustrated by a large number of mounted specimens of the more noteworthy additions.

Mr. J. R. MATTHEWS exhibited the hybrid *Potamogeton venustus* from the River Earn.

A number of plants in flower were shown from the Royal Botanic Garden.

MAY 18, 1922.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

Mr. L. B. STEWART read a note on Juvenile Characters in Root and Stem Cuttings of *Acanthus montanus* (see p. 117).

Dr. A. W. BORTHWICK communicated a note by Lieut.-Col. STEUART FOTHRINGHAM on Lobing of Rhododendron Leaves, describing various abnormalities of leaves, of which he also exhibited specimens.

Mr. WILLIAM EVANS read a note on the occurrence of *Anthoceros* in Scotland, giving a new record for W. Lothian of *A. punctatus*, Linn., of which he exhibited a specimen.

JUNE 15, 1922.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

Mr. J. R. SIMPSON was elected a Resident Fellow.

The PRESIDENT read an obituary notice of WILLIAM CARRUTHERS, the oldest member of the Society, who died on 1st June (see p. 118).

Mr. A. D. RICHARDSON exhibited specimens of *Arabis albida, fl. pl.*, with a peculiar variation in the doubling.

Dr. MALCOLM WILSON exhibited injured seedlings of Scots Pine and Douglas Fir where the injury consisted of the crushing of a ring of cortex and bark a few inches above ground level, probably caused by the use of a planting frame. This resulted in a swelling by abnormal growth above the injury and a downward development of callus tissue. Such plants ultimately die.

PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXVII

OCTOBER 19, 1922.

W. G. SMITH, B.Sc., Ph.D., President, in the Chair.

The following Office-Bearers were elected for Session 1922–1923:—

PRESIDENT.

Professor W. WRIGHT SMITH, M.A., F.L.S., F.R.S.E.

VICE-PRESIDENTS.

T. BENNET CLARK, C.A.
JAMES FRASER, Esq.
SYMINGTON GRIEVE, Esq.
R. STEWART MACDOUGALL, M.A., D.Sc.

COUNCILLORS.

A. W. BORTHWICK, O.B.E., D.Sc.
J. RUTHERFORD HILL, Esq.
ANDREW HOWISON, M.A., B.Sc.
Col. H. H. JOHNSTON, C.B., C.B.E., F.L.S.
Mrs C. NORMAN KEMP, M.A., D.Sc.
W. G. SMITH, B.Sc., Ph.D.
Sir JOHN STIRLING MAXWELL, Bart.
JAMES WHYTOCK, Esq.
MALCOLM WILSON, D.Sc., F.L.S., F.R.S.E.
WILLIAM YOUNG, Esq.

Honorary Secretary—J. R. MATTHEWS, M.A., F.L.S.
Foreign Secretary—Very Rev. D. PAUL, M.A., D.D., LL.D.
Treasurer—ANDREW MASON, Esq., c/o RICHARD BROWN & Co., C.A
Assistant-Secretary—J. T. JOHNSTONE, M.A., B.Sc.
Artist—Professor FRANCIS M. CAIRD, M.B., C.M., F.R.C.S.E.
Auditor—ROBERT C. MILLAR, C.A.

LOCAL SECRETARIES.

Aberdeen—Professor W. G. Craib, M.A.
Calcutta—Professor S. C. Mahalanobis, B.Sc., F.R.S.E., F.R.M.S., Presidency College.
Cambridge—Arthur Evans, Sc.D.
Croydon—A. Bennett, A.L.S.
East Liss, Hants—James Sykes Gamble, M.A., C.I.E., F.R.S.
Glasgow—Professor F. O. Bower, Sc.D., F.R.S., F.L.S.
London—J. F. Duthie, B.A., F.L.S.
„ E. M. Holmes, F.L.S., F.R.H.S.
„ Lieut.-Col. Sir David Prain, M.D., C.I.E., F.R.S., F.L.S.
Philadelphia, U.S.A.—Professor J. M. Macfarlane, D.Sc., F.R.S.E.
St. Andrews—Professor M'Intosh, M.D., LL.D., F.R.S.E.
„ Robert A. Robertson, M.A., B.Sc.
Toronto, Ontario—The Hon. W. R. Riddell, B.Sc., B.A., LL.D.

Mr. David King was elected a Resident Fellow.

Dr. R. J. D. Graham read a paper on Iraq Arabi, which was well illustrated by a fine series of lantern slides.

Dr. W. G. Smith exhibited specimens of *Mucilago spongiosa* occurring on Strawberry.

Dr. Malcolm Wilson exhibited specimens of *Cantharellus carbonarius* (A. et S.) Fr., collected near Edinburgh. Although this species is described as common in England, this appears to be the first record for Scotland. It was found on burnt ground which was intermixed with pieces of charcoal, which is described as its usual habitat and accounts for its specific name. The species, which shows the usual characters of *Cantharellus*, is characterised by possessing well-developed root-like mycelial strands which pass off from the base of the stem. On account of these structures the species is also known as *Cantharellus radicosus* (B. et Br.) Fr.

Mr. H. F. Tagg exhibited specimens from Jersey of galls on Acorn Cups caused by *Cynips quercus-calicis*.

NOVEMBER 16, 1922.

Professor W. WRIGHT SMITH, M.A., F.L.S., F.R.S.E., President, in the Chair.

Miss AGNES CHALMERS, Mrs. DOUIE URQUHART, and Mr. E. M. BUCHANAN were elected Resident Fellows.

Mr. DAVID M'CALL was elected a non-Resident Fellow.

Miss H. C. ABERNETHY, Miss C. C. BURT, Miss A. N. CUMMING, Miss E. M. HENDERSON, Miss M. M. B. KNAGG, Miss K. MASSEY, and Miss M. J. F. WILSON were elected Ordinary Members.

The PRESIDENT read an obituary notice of WILLIAM EVANS, an Associate of the Society since 1871 (see p. 189).

Mr. IAN W. SEATON read a paper on the Seedling Structure of *Salix pentandra* (see p. 161).

Dr. MALCOLM WILSON read a paper on *Puccinia mirabilissima*, Peck (see p. 164).

Mr. J. R. MATTHEWS exhibited *Azolla filiculoides*, Lam., from Norfolk, and *Tillaea aquatica*, Linn., from Yorkshire.

Mr. J. RUTHERFORD HILL exhibited specimens of Calabar Beans and of the drugs made from them.

The following plants in flower were shown from the Royal Botanic Garden :—*Cirrhopetalum Makoyanum*, Reichb. f. ; *Coelogyne* (*Pleione*) *maculata*, Lindl. ; *Dorstenia yumbuyaensis*, De Wild. ; *Hamelia patens*, Jacq. ; *Masdevallia Laucheana*, Hort. Sander. ; *Pinguicula caudata*, Schl. ; *Pleurothallis astrophora*, Reichb. f. ; *Sempervivum tabulaeforme*, Haw. ; *Stenoglottis longifolia*, Hook. f.

DECEMBER 21, 1922.

Professor W. WRIGHT SMITH, M.A., F.L.S., F.R.S.E., President, in the Chair.

The TREASURER, Mr. ANDREW MASON, submitted the following Statement of Accounts for Session 1921–1922:—

INCOME.

Annual Subscriptions for 1921–1922	£32	10	0
Do. Arrears	2	5	0
Transfer from Life Members' Fund	14	10	10
Transactions sold	6	1	6
Interest on Funds Invested and in Bank	7	19	2
Subscriptions to Publications Fund	18	18	0
	£82	4	6

EXPENDITURE.

Printing *Transactions* for Session 1920–1921	£27	6	9
Printing Notices for Meetings, etc.	22	6	0
Rooms for Meetings and Tea	11	2	0
Stationery, Postages, Carriages, etc.	3	10	8
Fire Insurance on Books, etc.	0	5	0
Honorarium to Treasurer	3	3	0
	£67	13	5
Excess of Income over Expenditure	£14	11	1

STATE OF FUNDS.

Life Members' Fund.

Balance of Fund at close of Session 1920–1921				£144	18	5
Add—Life compositions received				47	5	0
				£192	3	5
Deduct—Transferred to Income				14	10	10
Balance as at close of Session				£177	12	7

Ordinary Fund.

Balance of Fund at close of Session 1920–1921	£38	16	6				
Add—Increase during Session 1921–1922	14	11	1				
Balance as at close of Session, subject to expense of printing *Transactions*				53	7	7	
Total Funds				£231	0	2	

Being :—£100 5% War Stock, 1929–1947	£95	0	0			
Sum in Current Account with Union Bank of Scotland, Ltd. .	12	0	2			
Sum in Deposit Receipt with do.	125	0	0			
	£232	0	2			
Less—Subscriptions received in advance	1	0	0			
As above .				£231	0	2

Note.—Subscriptions in arrear, considered recoverable : 1920–21, £1 10s. ; 1921–22, £4, 10s.

EDINBURGH, 6*th December* 1922.—I hereby certify that I have audited the Accounts of the Treasurer of the Botanical Society of Edinburgh for Session 1921–1922, and have found them correct. I have also checked the foregoing Abstract, and find it correct.
ROBT. C. MILLAR, C.A., *Auditor.*

Miss EDITH PHILIP SMITH, Mr. GEORGE CROSBIE TAYLOR, Mr. IAN W. SEATON, Mr. HERBERT M. LEWIS, and Miss DOROTHY G. WILSON were elected Resident Fellows.

The PRESIDENT read an obituary notice of Sir ISAAC BAYLEY BALFOUR (see p. 192.)

Miss D. G. WILSON read a paper, Observations on the Leaf of *Senecio gonocladus* (see p. 167).

Professor W. WRIGHT SMITH read a paper, Notes on Chinese Lilies (see p. 122).

Dr. R. S. MACDOUGALL exhibited specimens of *Eriophyes fraxini* on the Ash, and of *Enarmonia diniana* on *Pinus sylvestris*.

Mr. J. L. S. SMITH exhibited specimens of Cone Disease of *Pinus sylvestris*, sometimes called Multiple-coning.

Professor W. WRIGHT SMITH exhibited specimens of *Osmanthus Forrestii*, Rehder, a new species from Yunnan.

Two paintings of the old Royal Botanic Garden, Leith Walk, were exhibited.

The following plants in flower were shown from the Royal Botanic Garden :—*Arctostaphylos Manzanita*, Parry ; *Cirrhopetalum Micholtzii*, Rolfe ; *Crassula impressa*, N. E. Br. ; *Euadenia eminens*, Hook. f. ; *Lardizabala biternata*, Ruiz et Pav. ; *Lycaste macrophylla Measuresiana* ; *Masdevallia poly-*

sticta, Reichb. f.; *Mesembryanthemum Elishae*, N. E. Br.; *Odontoglossum crispum*, var.; and *Oncidium cucullatum*, Lindl.

JANUARY 18, 1923.

SYMINGTON GRIEVE, Esq., Vice-President, in the Chair.

Mr. HARRY G. YOUNGER was elected a Resident Fellow.

The Hon. BERNARD F. ROLLO was elected a non-Resident Fellow.

Mr. ROBERT M. ADAM read a paper on Mingulay, an Outer Isle of the Hebrides, in which he described the flora of the island and its changes during the last few years brought about principally by its being deserted by its former inhabitants some ten years ago. He also showed a large series of lantern slides illustrating his paper, giving also some studies of bird life on the western cliffs of the island.

FEBRUARY 15, 1923.

Professor W. WRIGHT SMITH, M.A., F.L.S., F.R.S.E., President, in the Chair.

Mr. E. H. M. COX was elected a non-Resident Fellow.

The PRESIDENT announced the death of M. GASTON BONNIER, who had been an Hon. Foreign Fellow since June 1902.

Miss EDITH PHILIP SMITH read a paper on Plant Respiration as affected by anæsthetics.

Miss HELEN I. ALLAN GRAY communicated a paper on Seed Treatment and Germination in Conifers.

Dr. MALCOLM WILSON exhibited specimens of *Aecidium Otites*, Schlechtd. on *Silene densiflora*, Urv., collected in Macedonia. The aecidia are associated with sori of unicellular teleutospores, which indicates that the fungus is a species of *Uromyces*.

Mr. J. R. MATTHEWS read a paper, Notes on Scottish Plants (see p. 170), and exhibited specimens of *Potamogeton* and *Callitriche*.

Miss ELSIE CADMAN exhibited specimens of *Actinomyces Scabies*, the cause of common Potato Scab, and gave some account of the disease.

The following plants in flower were shown from the Royal Botanic Garden :—*Lathraea clandestina*, Linn. ; *Rhododendron acuminatum*, Hook. f. ; *R. argenteum*, Hook. f. ; *R. barbatum*, Wall. ; *R. irroratum*, Franch. ; *R. moupinense*, Franch. ; *R. nobleanum* (*arboreum* × *caucasicum*) ; *R. nobleanum album* (*arboreum album* × *caucasicum*) ; and *R. praecox* (*dahuricum* × *ciliatum*).

MARCH 15, 1923.

Professor W. WRIGHT SMITH, M.A., F.L.S., F.R.S.E., President, in the Chair.

Mr. JOHN H. GRAY was elected a Resident Fellow.

Mr. ERNEST V. LAING read a paper on Mycorhiza and Tree Growth in Peat, which he illustrated by lantern slides.

Dr. R. J. D. GRAHAM exhibited specimens of *Crocus vernus* showing pull roots.

A portrait of Linnaeus engraved from a copy of Hoffman's painting was exhibited.

The following plants in flower were shown from the Royal Botanic Garden :—*Aerides vandarum*, Reichb. f. ; *Vanda teres*, Lindl. and *Aerio-vanda Mundayi*, Hort. Edin., a hybrid between *Aerides vandarum* and *Vanda teres* ; *Primula Allioni*, Loisel. ; *P. darialica*, Rupr. ; *P. Fortunei*, Vatke ; *P. frondosa*, Janka ; *P. obconica alba* ; *P. philoresia*, Balf. f. ; *Saxifraga Boydii*, Hort. Dewar ; *S. Burseriana*, var. ; *S. Irvingi*, Hort. ; *S. latina*, Hayek ; *S. Rudolphiana*, Reichb. f. ; and *Soldanella pusilla*, Baumg.

APRIL 19, 1923.

Professor W. WRIGHT SMITH, M.A., F.L.S., F.R.S.E., President, in the Chair.

Col. H. H. JOHNSTON read a paper, Additions to the Flora of Orkney as recorded in Watson's Topographical Botany, 2nd ed., 1883 (see p. 174), and exhibited a number of interesting illustrative specimens collected by himself.

Dr. J. M. DALZIEL exhibited specimens of *Barteria nigritana*, a Nigerian Myrmecophyte.

Mr. J. Rutherford Hill exhibited a piece of Carnauba Wax which had been found floating in the sea on the Ayrshire Coast.

The following species of Primula in flower were shown from the Royal Botanic Garden :—*P. conspersa*, Balf. f. et Purdom ; *P. deflexa*, Duthie ; *P. fasciculata*, Balf. f. et Ward ; *P. Forrestii*, Balf. f. ; *P. Giraldiana*, Pax. ; *P. involucrata*, Wall. ; *P. Maclareni*, Balf. f. ; *P. Marven* (*marginata* × *venusta*) ; *P. Menziesiana*, Balf. f. et W. W. Sm. ; *P. redolens*, Balf. f. et Ward ; *P. rupicola*, Balf. f. et Forrest ; *P. saxatilis*, Kom. ; *P. Sieboldii*, E. Morren ; *P. sino-Listeri*, Balf. f. ; and *P. Werringtonensis*, Hort. Wallace.

MAY 17, 1923.

Professor W. Wright Smith, M.A., F.L.S., F.R.S.E., President, in the Chair.

Mr. R. A. Taylor was elected a non-Resident Fellow.

Dr. R. J. D. Graham and Mr. L. B. Stewart communicated a paper on the Vegetative Propagation of *Haemanthus hirsutus*, Baker (see p. 183).

Mr. M. Y. Orr exhibited specimens of abnormal flowers of Wallflower.

JUNE 21, 1923.

Professor W. Wright Smith, M.A., F.L.S., F.R.S.E., President, in the Chair.

Dr. G. C. Druce, Dr. R. Lloyd Praeger, and Dr. A. B. Rendle were elected Hon. British Fellows.

Professor D. H. Campbell, Professor R. Chodat, Professor J. M. Coulter, Professor Seittsiro Ikeno, Professor Henri Lecomte, Dr. J. P. Lotsy, Professor Jean Massart, Dr. D. T. MacDougall, Dr. C. H. Ostenfeld, Professor W. J. V. Osterhout, Professor Roland Thaxter, Professor J. F. N. Wille, and Mr. E. H. Wilson were elected Hon. Foreign Fellows.

Miss Elsie Cadman exhibited specimens, microscopic slides, and photographs, showing various stages in the life-history of *Reticularia Lycoperdon*, Bull., and gave some account of its life-history.

TRANSACTIONS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXIV.

The Pharmacopoeia of another Botanical Physician.

By The Hon. William Renwick Riddell, B.Sc., LL.D., etc.

(Read 3rd October 1919.)

In two papers read before this Society, 13th November 1913 and 14th January 1915 (Trans. Bot. Soc. Edin., vol. xxvi, pp. 226 sqq., pp. 411 sqq.), there were enumerated the remedies recommended by Samuel Thomson, founder of the Thomsonian School of Medicine, and by certain of his followers.

It was most natural that many divergencies from the original teaching of the Master would appear in the course of time—anything so fundamental as health and its conservation inevitably leads to divagations from the path laid out by a first discoverer: accordingly we find the textbooks and health manuals purporting to be founded on the teachings of the empiric Thomson differing widely from those of Thomson and from each other.

The subject of the present paper is one of the most valued and best known of these manuals, published at Boston, Massachusetts, in 1836. The book is a 12mo of 176 pages, whose title-page reads as follows:—

"Every man his own Physician"

THE

VEGETABLE FAMILY PHYSICIAN

CONTAINING

A DESCRIPTION

OF

The Roots and Herbs Common to this Country with their Medicinal Properties and Uses

ALSO

DIRECTIONS

For the Treatment of the Diseases Incident to Human Nature by Vegetables Alone

EMBRACING

MANY VALUABLE INDIAN RECIPES

By SAMUEL B. EMMONS

BOSTON
GEORGE T. OAKES
Pemberton Hill, opposite the head of Hanover Street
1836

The author was the editor of the Botanical Journal, a monthly magazine published at Boston, Mass., devoted to spreading the doctrines of the Reformed Thomsonian method of cure. He seems to have known considerable about the botany of his district, and most of his descriptions of plants are clear and readily recognisable.

He begins by a description of about 125 plants, adding their medicinal properties; then he enumerates a number of diseases and gives a number of "useful and valuable recipes," almost all of purely vegetable composition. He adds short chapters on Diseases of Children (where, by the way, we miss the familiar "salts and senna" and castor

oil); Collecting and Curing Herbs, Barks, and Roots; the Manufacture of Decoctions, Defusions, and Syrups; the Steam and Vapour Bath (borrowed from the Indians); the Medical Treatment of George Washington's last illness (he was attacked with croup, a bleeder took 12 to 14 ounces of blood from him almost at once, and then two more copious bleedings followed—some 20 to 25 ounces each; a physician came and administered two doses of calomel; next morning another bleeding, making in all 80 to 90 ounces of blood drawn, then 10 grains more of calomel and 5 or 6 grains of tartar emetic, then blisters to the extremities and a cataplasm of bran and vinegar to the throat—and, after all that, the stubborn Father of his Country was so ungrateful as to die); a chapter on Cleanliness follows, and one on the Pernicious Effects of Mercury; a satirical chapter on How to get Dyspepsia, and a chapter on Fevers (which ends thus—"There is no other way to cure a fever but to increase the heat, drive out the cold, open the pores, clear the stomach and bowels, and bring a proper balance in the system; then the patient is in health with no torment left behind," which is as sententious and about as valuable as anything Sydenham ever wrote).

As with the Vermont practitioners whose treatise was discussed in the later of the papers already mentioned, little attention is paid by this author to Thomson's Courses of Physic—Emmons does not even give the formula for the celebrated "Six Numbers"; his system is based to a great extent on Thomson's, but it has a right to the title "Reformed Thomsonian" at all events, if the rather common definition is applied here to the word "Reformed," making it synonymous with "changed."

In the following list Nos. 1–58 are given by Thomson himself; Nos. 59–128 by the Vermont Thomsonian Physicians; Nos. 129 sqq. are given by Emmons—those in the former two lists, but not used by Emmons, are placed in parenthesis. The name given by the author to a plant is in italics, the nomenclature is that of Dr. Asa Gray's Field, Forest, and Garden Botany; for convenience sake all the plants named in the three lists are here classified. It will be seen that Emmons does not employ Nos. 26, 28, 29, 36,

40, 50, 52, 53, 58 of Thomson's list, or Nos. 66, 67, 69, 74, 90, 94, 95, 99, 108, 109, 112, 116 of the Vermont list; but he adds ninety-five plants—he therefore uses 202 plants in all.

RANUNCULACEAE.—1. *Golden Seal, Indian Paint, Yellow Root*, Hydrastis Canadensis, a powerful tonic, good for jaundice, inflamed eyes, and sore legs.

59. *Goldthread*, Coptis trifolia, a pure intense bitter, promoting digestion and strengthening the system—the root only used. Made into a tea with Live-for-ever (No. 136) is a good gargle.

60. *Black Cohosh, Rattle Weed, Squaw Root, Black Snake Root*, Cimicifuga racemosa, much used in rheumatism and to settle stomach.

129. *Garden Peony*, Paeonia officinalis, the root dried and pulverised, of considerable efficiency in the cure of epilepsy and fits in children.

130. *Liver Wort*, Hepatica triloba, for bleeding at the lungs, consumptions, coughs, and liver complaint, also for jaundice—the roots and leaves made into a tea and drunk cold.

131. *Crowfoot, Yellow Weed*, Ranunculus acris, made into a tea, with brandy, for dysentery (see Nos. 187, 48).

MAGNOLIACEAE. — 61. *Whitewood, Tulip Tree, White Poplar, Whitewood Tree*, Liriodendron tulipifera—bark of both body and root a tonic bitter, useful in dysentery, hysterics, dyspepsia, worms, and general debility; also with Nos. 23, 107, and 162 in erysipelas.

BERBERIDACEAE.—132. *Barberry*, Berberis Canadensis. Root a good bitter tonic, beneficial in fevers, diarrhœa, and dysentery.

133. *Blue Cohosh, Blue Berry, Pappoose Root, Blue Gensing*, Caulophyllum thalictroides. Roots used for rheumatism, dropsy, cramps, epilepsy, etc.; an emmenagogue and useful in specific diseases.

134. *Mandrake, May-Apple*, Podophyllum peltatum, a mild purge, vermifuge, and the juice used in deafness. (This has been adopted as a cholagogue by the regular profession.)

NYMPHAEACEAE. — 2. *White Pond Lily*, Nymphaea odorata or N. tuberosa, excellent applied to tumors and inflammation to ease pain and promote suppuration.

PAPAVERACEAE.—62. *Celandine*, Chelidonium majus, an ointment made of the root simmered in lard used for many purposes. Good for jaundice given as a "tea alone or with a little chimney soot added." (See No. 21.)

63. *Bloodroot*, Sanguinaria Canadensis, juice good for an emetic, powder used to destroy proud flesh, snuffed up will cure polypus; good for croup, rheumatism, and jaundice.

CRUCIFERAE.—3. *Mustard*, Brassica nigra, used with other plants to make a decoction which "has saved many lives" in dropsy.

4. *Horseradish*, Nasturtium Armoracia, an appetiser and cures colds, coughs, etc.; also useful in jaundice, biliousness, etc.

64. *Raddish*, Raphanus sativus, juice useful in cases of renal calculi.

65. *Cabbage*, Brassica oleracea, a leaf used in making a salve for felons, whitlows, etc.

(66. *Scurvy Grass*, Barbarea praecox.)

135. *Shepherd's Purse*, Capsella Bursa-Pastoris, an astringent good for all kinds of fluxes: in a poultice used for external inflammations, especially erysipelas.

136. *Water-cresses*, Nasturtium officinale, quickens the appetite and purges the blood, "exceeding useful in scrofula and consumptive disorders."

222. (See *post*.)

VIOLACEAE.—137. *Blue Violet*, Viola cucullata, used with Mandrake root and Blood root to make cathartic powders.

CISTACEAE.—138. *Frost Weed, Scabious*, Helianthemum Canadense (or A. corymbosum), relieves chronic diarrhœa, dysentery, dysury, gout, dropsy, etc. Made into a syrup is good for hacking cough and bleeding at the lungs.

HYPERICACEAE.—139. *John's Wort* (the common St. John's wort), Hypericum pyramidatum, in a tea relieves the lungs and breast, removes hysterical, hypochondriacal, and maniacal disorders.

CARYOPHYLLACEAE.—140. *Pink*, "the common garden pink" Dianthus Chinensis (and other species) is "a fine carminative and internal anodyne."

141. *Cockle, Cuckold,* Lychnis Githago, the leaves, seeds, and roots with other ingredients in a tea for erysipelas.

142. *Soapwort,* Saponaria officinalis, "good for the jaundice and obstructions of the liver, and is thought by some to be superior to sarsaparilla for the cure of lues venerea."

143. *Mouse-ear,* Cerastium vulgatum, made into a tea with brandy (forming one-fourth by bulk) good for dysentery.

PORTULACACEAE.—144. *Purslain* (the common purslane), Portulaca oleracea, should be used as a common drink for epileptic fits, cramps, convulsions, etc.; also the juice with No. 41 in snakebites.

MALVACEAE.—145. *Red Rose Willow* (apparently a mere mistake for *Mallow*), Hibiscus Moscheutos (and perhaps other species), "a fine tonic and astringent . . . bracing up weak women."

146. *Marsh Mallow,* Althaea officinalis, a decoction to be given "when the gout attacks the kidneys."

(TILIACEAE.—67. *Basswood,* Tilia Americana.)

LINACEAE.—68. *Flaxseed,* Linum usitatissimum, in tea for cholera morbus, etc.

GERANIACEAE.—(69. *Wood Sorrel,* Oxalis Acetosella.)

70. *Cranesbill,* Geranium maculatum, valuable "for wounds, ulcers, . . . the lues venerea, . . . cholera infantum, . . . bleeding of the lungs, . . . this root with gentian will cure intermitting fevers more effectually than Peruvian bark."

RUTACEAE.—5. *Prickly Ash,* Zanthoxylum Americanum, "a good remedy for chronic rheumatism, . . . produces perspiration, . . . the berries are as good as the bark, . . . good for cold hands and feet, and for fits of the ague."

71. *Rue,* Ruta graveolens, an ingredient in Restorative Bitters with unicorn root, blood root, ginseng, tamarisk (tamarack) bark, nanny bush, devil's bit, Seneca snakeroot, sassafras bark, and golden seal. This made with Jamaica spirits (alias rum) "is celebrated for its fine restorative and strengthening qualities in indigestion, rheumatism, dropsy, pain in the breast, etc."

72. *Lemon,* Citrus Limonium, used in lemonade (the *Orange,* Citrus Aurantium, seems to be used only in the

peel to give a flavour to teas, etc.), either as a refreshing drink or to prevent vomiting.

ANACARDIACEAE. — 6. *Sumach,* Rhus typhina or R. aromatica, makes a gargle for sore throats or sore mouths, an antiseptic, makes good poultices for ulcers, good for hectic fever, scrofula, and lues venerea; used also in dying black and making ink.

RHAMNACEAE.—147. *Buckthorn,* Rhamnus catharticus, an ingredient in a tea to be given in cases of hernia.

CELASTRACEAE.—73. *Bittersweet,* Celastrus scandens, a tea good for liver complaint, will remove spots in the skin, good for cancers—when made into a poultice, good for swellings.

(SAPINDACEAE. — 74. *Striped Maple,* Acer Pennsylvanicum.)

POLYGALACEAE. — 148. *Seneca Snakeroot,* Polygala Senega, an "active stimulus," cures rattlesnake bites, good in croup, pleurisy, catarrh, asthma, coughs, and an effective emmenagogue.

LEGUMINOSAE.—7. *Red Clover,* Trifolium pratense, made into a tea for chlorosis.

75. *American Senna,* Cassia Marilandica, a simple cathartic.

76. *Indigo Weed,* Baptisia tinctoria, valuable for all kinds of ulcers, either as a wash, fomentation or poultice; also internally in gangrene, scarlet fever, sore throat, typhus and putrid fevers.

149. *White Beans,* Phaseolus nanus, a poultice for inflammations and swellings.

223. See *post.*

ROSACEAE.—Plum Family.

10. *Peach,* Prunus Persica, flowers and leaves made into a tea, a vermifuge; the meats in brandy a powerful tonic in debility, chlorosis, fever and ague, etc.; the bark in a tea with brandy, good for weak stomach.

11. *Wild Cherry,* Prunus Pennsylvanica, bark in a strong decoction to be applied to scrofulous tumors; in a tea with brandy for a weak stomach.

80. *Black Cherry,* Prunus serotina, the bark an ingredient in jaundice bitters.

Rose Family, proper.

150. *Hardhack*, Spiraea tomentosa, used to cure wounds.

8. *Avens Root, Chocolate Root*, Geum rivale, a wholesome drink used instead of chocolate, which it resembles in flavour, very strengthening for the sick, used in consumption.

151. *Cinquefoil, Five-finger*, Potentilla Canadensis, the root very beneficial in debility, lassitude, and night sweats.

9. *Red Raspberry*, Rubus triflorus or R. strigosus, frequently eaten, dissolves the tartarous concretions on the teeth.

77. *Blackberry*, R. villosus, the bark an ingredient in an ointment for scald head.

78. *Strawberry*, Fragaria Virginiana, fruit equally efficacious with raspberries in removing calcareous concretions on the teeth: much used in fevers, gout, gravel, scurvy, and consumption, relieves diseases of the bladder and kidneys; as a wash cures chilblains; both plant and leaves employed in tea for sore throat, swelled gums, jaundice, fevers, etc., etc., as cooling and astringent.

79. *Roses*, Rosa, of various species, as a decoction, fomentation or poultice allay inflammation, and as a tea are astringent and tonic.

152. *Agrimony*, Agrimonia Eupatoria, roots excellent for wind in the stomach and create an appetite, given as a powder or an infusion of roots and seeds.

Pear Family.

153. *Hawthorn*, Crataegus Oxyacantha, used with sage (Salvia officinalis) and balm (Monarda punctata or M. didyma) to make British herb tea, "an excellent and pleasant sanative tea, particularly wholesome to nervous people."

81. *Apple*, Pyrus Malus, the cider used for a drink in jaundice.

SAXIFRAGACEAE. — 154. *Gooseberry*, Ribes Grossularia the bark in decoction good for gravel; green berries scalded and baked procure appetite; young leaves made into a tea applied as a lotion to allay inflammation.

155. *Black Currant*, Ribes nigrum, bark has the same qualities as that of the gooseberry.

CRASSULACEAE.—156. *Live-for-ever*, Sedum Telephium,

with sage (Salvia officinalis, No. 97) or gold thread (Coptis trifolia, No. 59), in a tea good for sore throat; the blossoms chewed and the juice swallowed of great benefit in quinsy and sore throat.

HAMAMELACEAE.—12. *Witch Hazel*, Hamamelis Virginica, the leaves made into a tea, excellent for bowel complaints, bleeding at the stomach or lungs; as a snuff, a styptic for nose, etc.; a poultice of the bark removes painful inflammation of the eyes.

(HALORAGEAE.—82. *Marestail*, Hippuris vulgaris.)

CUCURBITACEAE.—157. *Wild Cucumber*, Sicyos angulatus (?) "strengthening, cooling, and nourishing, . . . the fresh root eaten early in the morning affords much relief in consumptive and debilitated cases."

158. *Watermelon*, Citrullus vulgaris, a handful of the seeds put in gin and allowed to stand for a week in a warm place, drink half a wineglassful two or three times a day—this is excellent for renal calculus, gravel, etc.

159. *Pumpkin*, Cucurbita Pepo. Pumpkin seed oil, a valuable remedy for hæmorrhoids.

UMBELLIFERAE.—83. *Carrots*, Daucus Carota, with flour and butter, an excellent application for sores, swellings, ulcers, etc.

160. *Sweet Cicely*, Osmorrhiza longistylis, used in making aromatic bitters.

161. *Caraway*, Carum Carui, German domestic remedy against hysterics.

84. *Parsley*, Carum Petroselinum (Petroselinum sativum), a powerful diuretic.

13. Archangel, called here *Angelica*, Archangelica atropurpurea, roots excellent for wind in the stomach, and cause an appetite.

162. *Masterwort*, Heracleum lanatum, the root ingredient in a brandy decoction for erysipelas with Nos. 14, 107, and the bark of No. 61.

ARALIACEAE.—14. *Gensing*, Aralia quinquefolia, the root with No. 162, etc., for erysipelas; also with No. 119 and nutmegs for St. Vitus's Dance.

85. *Spikenard*, Aralia racemosa, roots and berries in a tea good for coughs, weakness, and a general tonic; bruised and made into a poultice applied to wounds, ulcers, and

ringworms; made into a cordial recommended for gout; the juice for earache and deafness.

86. *Sarsaparilla*, Aralia nudicaulis, in a decoction good for all diseases of the skin, scrofulous sores, rheumatism, gout, mercurial diseases, and lues venerea.

CORNACEAE.—87. *Boxwood* or *Dogwood*, Cornus florida, the bark astringent, antiseptic, and stimulant either as a powder or as tea; used also berries, bark, and flowers for fevers and colics; with Sassafras officinale (No. 110) in a poultice to clean foul ulcers.

88. *Green-osier*, Cornus sericea (Kinnikinnik or Indian Tobacco), bark an ingredient in erysipelas tea and cancer tea—(it is possible, however, that the Salix cordata is meant).

CAPRIFOLIACEA.—89. *Elder*, Sambucus Canadensis or S. pubens, flowers in a tea for scurvy and bowel complaints; inner bark in dropsy, diuretic; made into an ointment cures eruptions of the skin; flowers in decoction useful in erysipelatous fevers; the berries for the same purposes as bark and flowers.

(90. *High Cranberry*, Viburnum Opulus.)

163. *Nanny Bush, Black Haw*, Viburnum prunifolium, "the bark is an excellent tonic and is considered superior to Peruvian bark."

RUBIACEAE.—15. *Cleavers, Goosegrass*, Galium Aparine, diuretic, crumbles calculi of kidneys or bladder, but "being of a cold nature it is not proper in dropsies or other diseases of cold and debility."

(91. *Partridge Berry*, Mitchella repens.)

164. *White Ball, Butterwood Shrub, Little Snowball, Swampwood, Dogwood, Globe Flower*, Cephalanthus occidentalis, tonic, cathartic, diaphoretic, flowers, leaves, bark of stems and roots; a fine fragrant syrup made of the leaves and roots a mild laxative and tonic; a decoction of the bark of the roots cures intermittent fevers and is useful in diarrhœa.

VALERIANACEAE.—16. *Valerian*, Valeriana officinalis or V. sylvatica, an excellent medicine in nervous complaints, epilepsies, hysteria, and hypochondria, one or two teaspoonfuls of the powdered root two or three times a day. (This plant is called "White Snake Root" in this work;

that name is more commonly used of the Eupatorium ageratoides.)

COMPOSITAE. — 17. *Frostweed*, Senecio aureus, relieves chronic diarrhœa, dysury, gravel, gout, etc., etc.; used externally in wounds, tumours, etc.

18. *Elecampane*, Inula Helenium, for diseases of the lungs, coughs, asthmas, and consumptions—a good diuretic and diaphoretic, laxative, alterative, and tonic.

165. *Yarrow*, Achillea Millefolium, a detergent, has cured cancer of the breast, stops spitting of blood and dysentery.

166. *Ox-eye*, *Sneezewort*, Achillea Ptarmica, tonic and febrifuge, produces sneezing; good for headaches, deafness, etc.

19. *Mayweed*, Maruta Cotula, useful in colds, fevers, rheumatism, and asthma; if given with an emetic promotes vomiting; very sudorific; externally used in fomentations.

20. *Wormwood*, Artemisia Absinthium, used in stomach complaints, fevers, dropsy, and jaundice, and as a vermifuge; an antiseptic, as a poultice relieves pain from a bruise, and prevents discoloration and swelling.

167. *Mugwort*, Artemisia vulgaris, a tea given in chlorosis.

168. *Southernwood*, Artemisia Abrotanum, vermifuge, as a salve cures sciatica, gout, and rheumatism.

21. *Tansy*, Tanacetum vulgare, leaves and seed for worms; decoction or juice drunk in wine useful in "stranguary" and in weakness of the kidneys; used in jaundice with Nos. 25 and 62.

22. *Chamomile*, Anthemis nobilis, a cheap and pleasant bitter; flowers excite vomiting when taken in tea; boiled in cow's milk good for diseased eyes; bruised and moistened with vinegar applied to sprains and bruises.

23. *Burdock*, Lappa officinalis, diuretic and diaphoretic, also to purify the blood; seeds good for dropsy, scurvy, rheumatism, gout, inflammation of the kidneys, and lues venerea; leaves good applied to the feet in fevers. The root used with No. 162 for erysipelas.

24. *Thoroughwort*, *Boneset*, Eupatorium perfoliatum, an intense bitter, an emetic as a warm decoction, a powerful tonic as a cold infusion—the cold infusion in large doses is cathartic, cleanses the stomach and throws off disease;

for colds a complete remedy, useful in indigestion of old people, excellent in bilious colic, etc., in fact it seems as great a panacea as its sister E. purpureum, the famous Joe-Pye weed.

25. *Feverfew*, Chrysanthemum Parthenium, a decoction with celandine and tansy drunk plentifully will cure jaundice.

(26. *Golden Rod*, Solidago nemoralis.)

27. *Wild Lettuce*, Lactuca Canadensis, used as an ingredient in a decoction for curing "canker."

(28. *Bitter Thistle*, Silybum Marianum.)

(29. *Cardis benedictus*, Cnicus benedictus.)

92. *Coltsfoot*, Tussilago Farfara, good for scrofula, a consumptive cough, a warming stimulant, diaphoretic; "a snuff made of the leaves is good for the eyes and head, and the whole plant made into beer is very grateful and medicinal in colds," obstructions, whooping-cough, asthma, pains in the breast, etc.; an infusion is good for the ague.

169. *Marigold*, Calendula officinalis, leaves mixed with vinegar ease pain in any swelling and in inflammations.

170. *Sunflower, Wild Sunflower*, Helianthus giganteus or H. divaricatus, carminative, antispasmodic, and laxative, the most efficacious remedy for bilious colic known.

171. *Garden Sunflower*, Helianthus annus, an ingredient with No. 170 and several other native and foreign plants in "Dr. Hull's Genuine Bilious Physic."

172. *Succory*, Cichorium Intybus, juice "of service in obstructures of the viscera, jaundice, cutaneous eruptions, intestinal weakness, and hypochondriacal affections."

173. *Rattlesnake Root*, Nabalus altissimus or N. albus, in canker in the mouth and intestines, especially in children.

102. *Dandelion*, Taraxacum Dens-leonis, "an excellent article for the real affection of the liver," the roots are bruised and boiled, a good sudorific; also good for the kidneys, a diuretic.

174. *Wild Lettuce*, Lactuca Canadensis, with Cranesbill (No. 70), White Lily or Goldthread (No. 52) in a decoction for canker.

175. *Scabious, Fleabane*, Erigeron Philadelphicum, for chronic diarrhœa, dysury, dropsy, etc.

223. (See *post.*)

LOBELIACEAE.—30. *Lobelia*, Lobelia inflata, a cure-all as with all the Thomsonian School, chiefly as an emetic or clyster.

ERICACEAE.—31. *Pipsissewa, Prince's Pine*, Chimaphila umbellata, "valuable internal medicine for fevers, rheumatism, diseases of urinary organs, scrofula, cancer, dropsy, and nervous debility; externally for bathing rheumatic joints, ulcers, and hard swelling; the tops and roots made into a tea for both internal and external use.

93. *Wintergreen, Checkerberry, Mountain Tea, Deerberry, Spice-berry. Tea-berry, Ground Ivy, Hill-berry*, Gaultheria procumbens, "stimulant, anodyne, astringent, sudorific, milky, and cordial"; in an ointment for blows and bruises; the oil relieves toothache. ("Wintergreen" sometimes means the Pylora genus.)

(94. *Uva Ursi*, Arctostaphylos Uva-ursi.)

(95. *Cranberry*, Vaccinium of different species.)

176. *Black Alder*, Ilex verticillata, berries steeped in wine or brandy an excellent bitter and a good anthelmintic, the bark in a tea good for diseases of the skin, and a good wash for bad ulcers and sores. (The name "Black Alder" is sometimes given to the Silex nigra, but the description given by the author identifies this with the Ilex verticillata or common Winterberry.)

PLANTAGINACEAE.—96. *Plaintain*, Plantago major, the roots and branches with those of the hoarhound (No. 41) bruised and the juice squeezed out, given internally for snake-bites.

OROBANCHACEAE.—177. *Cancer Root, Beech Drops*, Epiphegus Virginiana, a powerful astringent, the fresh bruised root has cured cancer; beneficial in the cure of St. Anthony's Fire; a decoction "a certain cure for wounds, bruises, scalds, and for members nipped by frost."

(PLUMBAGINACEAE. — 33. *Marsh Rosemary*, Statice Limonium.)

PRIMULACEAE. — 178. *Water Pimpernel, Brookweed, Brooklime*, Samolus Valerandi, var. Americanus, in a drink antiscorbutic, diuretic, febrifuge, and an excellent emmenagogue and ecbolic, good also in fevers and coughs.

SCROPHULARIACEAE. — 32. *Snakehead, Brook Aloes*, Chelone glabra, vermifuge.

179. *Brinton Root, Black Root, Bowman Root, Culver's Root,* Veronica Virginica, "the favourite medicine of the famous Indian doctor Hough; he used it to cure disorders of the stomach and bowels, to destroy humours in the blood, to remove costiveness, and to cool fevers"; very useful in pleurisy, typhus, and bilious fevers.

(The author is in error in calling this Bowman's Root, that is Gillenia trifoliata of the Rosaceae, Plum Family.)

180. *Scrofula Plant,* Scrophularia nodosa, in a tea or poultice useful in scrofula or King's-Evil.

34. *Mullein,* Verbascum Thapsus, in a tea sweetened with molasses for hæmorrhoids.

VERBENACEAE.—35. *Vervain,* Verbena hastata or V. incisa, an excellent sudorific, used for colds; also a vermifuge and "a good article in gravelly complaints."

(36. *White Vervain,* Verbena urticifolia.)

LABIATAE.—181. *Lavender,* Lavendula vera, the flowers with sage (No. 97) and balm (No. 101) to make a British tea as a substitute for foreign tea.

(37. *Spearmint,* Mentha viridis.)

182. *Bugleherb,* Lycopus Virginicus, an excellent astringent, good for bleeding at lungs and stomach.

38. *Peppermint,* Mentha Piperita, a carminative in heartburn.

29. *Pennyroyal,* Hedioma pulegioides, in a tea for chlorosis.

(40. *Summer Savory,* Satureia hortensis.)

41. *Hoarhound,* Marrubium vulgare, with plaintain (No. 96) in snakebites.

183. *Hyssop,* Hyssopus officinalis, for asthma, coughs, and all diseases of breast and lungs.

184. *Thyme,* Thymus vulgaris, a good tonic and stomachic, strengthens the lungs also.

97. *Sage,* Salvia officinalis, "stimulant, carminative, sweating, and tonic . . . excites the appetite," dried leaves made into a tea. The tea taken cold checks night sweats; an ingredient in British Herb Tea. (See No. 181, *supra.*)

98. *Origanum marjoram,* Origanum Majorana, the oil used in toothache dropped on lint and applied to the tooth.

(99. *Rosemary,* Rosmarinus officinalis.)

185. *Heal-all*, Brunella vulgaris, tonic, carminative, diuretic and stimulating, externally applied to sores, swellings, poison, headache, etc.; internally for headache, colic, cramp, dropsy, and indigestion.

100. *Scullcap*, Scutellaria laterifolia, "said to be a specific against the bite of a mad dog . . . long used with great success by a man of the name of Lewis in Westchester County, New York State, for the bite of mad dogs"—administered in a powder made of the dried herb. "Dr. Black, of New York City, says he has cured numbers of chorea or St. Vitus's Dance with one infusion of the herb . . . a good medicine . . . in convulsions, lockjaw, and all cases of nervous irritations."

101. *Balm*, Monarda didyma, an ingredient in British Herb Tea with hawthorn leaves (No. 153) and sage (No. 97.)

186. *Horsemint*, Monarda punctata, the juice "almost a specific for gravel or stone."

103. *Catnip*, Nepeta Cataria, a poultice for swellings, internally for headache, colic, hysterics, worms, and spasms —an emmenagogue, "If catnip was more used than it is, the services of the doctors would be less frequently required."

187. *Ground Ivy* (misprinted "Toy") *Gill*, Nepeta Glechoma, purifies the blood, promotes expectoration, snuffed up the nose cures the headache; good in consumption, jaundice, asthma, kidney complaints; the root ground makes with butternut root (No. 48) and crowfoot root (No. 131) a good poultice for rheumatism and gout.

188. *Motherwort*, Leonurus Cardiaca, relieves hysteria and insomnia, abates delirium and allays spasms, cramps, and convulsions; a good emmenagogue.

189. *Betony*, Betonica officinalis, "if gathered when just going to flower has the taste of tea and all its good qualities without its bad ones, and it, moreover, cures inveterate headaches."

POLEMONIACEAE.—190. *Jacob's Ladder*, Polemonium caeruleum, good for the gravel and stone.

BORRAGINACEAE.—104. *Comfrey*, Symphytum officinale, as a syrup good for internal injuries and soreness, diarrhœa, dysentery, etc.; also useful in pulmonary affections, relieving

coughs, etc. The fresh root bruised beneficial when applied to bruises, wounds, ulcers, and all local inflammations.

SOLANACEAE.—42. *Cayenne,* Capsicum annuum, good for cold hands and feet, rheumatism, etc.; powder sprinkled on old sores dries them up; steeped in brandy or vinegar and applied externally helps colic and dysentery; "cures ague in the face."

191. *Apple Peru,* Nicandra physaloides, leaves simmered in lard a topical application for burns.

43. *Bitter Sweet,* Solanum Dulcamara, a tea good for liver complaint, removes blotches from the face; applied topically is good for cancer and sores of all kinds.

192. *Henbane,* Hyoscyamus niger, in a salve with fresh butter or lard rubbed on the parts affords speedy relief in hæmorrhoids.

193. *Nightshade,* Atropa Belladonna, "Dr. Elisha Smith of New York says that nightshade . . . is almost a specific in the scarlet fever and putrid sore throat and in the black canker so called."

194. *Tobacco,* Nicotiana Tabacum, in a poultice with vinegar for the bite of poisonous reptiles; "a linen rag soaked in sweet oil, butter or lard and sprinkled over with yellow Scotch snuff is said to have performed wonderful cures in the quinsey and croup."

GENTIANACEAE.—195. *Gentian,* Gentiana quinquefolia and other varieties; an ingredient in Stoughton's Bitters.

196. *Columbo,* Frasera Carolinensis, the root an ingredient in strengthening syrup; "an excellent stomachic and strengthens the system generally."

APOCYNACEAE.—105. *Indian Hemp,* Apocynum cannabinum, an emetic and cathartic for rheumatism given in prickly ash (No. 5) tea.

ASCLEPIADACEAE. — 44. *Milkweed,* Asclepias phytolaccoides, or A. verticillata (probably the latter), an emetic, cures dropsy; infused in gin useful in gravelly disorders.

106. *Pleurisy Root, Butterfly Weed, Flux Root, Wind Root, White Root,* Asclepias tuberosa, "highly extolled for the cure of pleurisy, difficulty of breathing and all diseases of the lungs, colics, and griping pains in the stomach"; a mild purge.

OLEACEAE.—197. *White Ash,* Fraxinus Americana. "The

Indians when bitten (by a snake) after sucking the wound apply a strip of white ash bark above it to prevent the extension of the poison. The bites of spiders and such venomous insects require a similar treatment."

198. *Primhage,* Ligustrum vulgare, the bark an ingredient of cancer tea.

ARISTOLOCHIACEAE.—45. *Canada Snakeroot, Asarabaca,* Asarum Canadense, in a powder with lavender flowers (No. 181) and marjoram leaves (No. 98) dried for a sneezing powder to cause a copious discharge of the mucus; also with coltsfoot (No. 92), bayberry bark (No. 49), and blood root (No. 63) for a catarrh snuff—if wandering milkweed (No. 44) is added it cures the headache.

107. *Virginia Snakeroot, Seneca Snakeroot,* Aristolochia serpentaria, "first introduced in Virginia as a specific for the bite of a rattlesnake," useful also in pleurisies and catarrhs—with Nos. 14, 61, and 162 for erysipelas. (See No. 162.)

PHYTOLACCACEAE.—199. *Garget Poke Root,* Phytolacca decandra, the root as a poultice for swellings, ulcers, and rheumatism; "the juice dried in the sun to a salve has cured cancers"; recommended for the itch, ringworm, etc.

(CHENOPODIACEAE.—108. *Jerusalem Oak,* Chenopodium ambrosioides, var. Anthelminticum or C. Botrys, is repudiated by the author.)

POLYGONACEAE.—(109. *Smartweed,* Polygonum aviculare.)

46. *Curled Dock, Narrow Dock, Sour Dock, Yellow Dock,* Rumex crispus, root purgative, both seeds and root good for dysentery; roots pulverised or bruised made into an ointment or wash good for all diseases of the skin; a decoction used as a drink—excellent for scurvy, bad ulcers, and hard tumours; large doses are emetic.

200. *Sheep Sorrel,* Rumex Acetosella, useful in scurvy and inflammation, leaves roasted applied to tumours, wens, boils, etc., bring them steadily to a head.

201. *Water Dock,* Rumex orbiculatus, a wash for foul ulcers, spongy and putrid gums; internally for scorbutic tumours, rheumatism, and costiveness.

202. *Rhubarb,* Rheum Rhaponticum, a warm stomachic purge useful in gout.

LAURACEAE.—110. *Sassafras*, Sassafras officinale, mucilage from bark leaves and pith useful in dysentery; bark bruised and made up into a poultice with meal, a powerful antiseptic; the oil will generally cure tumours, wens, and inflammations.

203. *Feverbush, Spice Bush*, Lindera Benzoin, cooling and cordial, used by the Indians in all inflammatory complaints.

THYMELEACEAE.—204. *Low Wickup, Moosewood, Leather Bush*, Dirca palustris, "a powerful emetic and cathartic."

URTICACEAE.—47. *Slippery Elm*, Ulmus fulva, the mucilage made from the bark infused in water for dysentery, coughs, pleurisy, quinsy, etc.; useful in poultices for all purposes.

202. *Nettle*, Urtica dioica, leaves and seeds dried made into a snuff, a good remedy for polypus.

111. *Hops*, Humulus Lupulus, an excellent stomachic bitter for dyspepsia, and also in inflammation of the kidneys and gravelly complaints; externally as a poultice made with hot vinegar for all pains, especially spasmodic pains, a poultice or ointment an anodyne to cancers and painful ulcers.

JUGLANDACEAE.—48. *Butternut*, Juglans cinerea, "the bark, particularly that of the root, an excellent cathartic taken in extract pill or cordial." With Crowfoot (No. 131) and ground ivy (No. 187) for rheumatism or gout poultice.

(112. *Hickory*, Carya alba.)

CUPULIFERAE.—113. *White Oak*, Quercus alba, the bark "nearly equal to the Peruvian bark in its tonic and astringent powers. In checking mortification it has succeeded where Peruvian bark had failed"; useful as an infusion topically applied in hernia.

114. *Red Oak*, Quercus rubra, potash made of ashes applied to cancers, the bark used as No. 113; acorns of all oaks roasted used for acorn coffee, a "wholesome, nourishing, strengthening instrument for mankind."

(115. *Beech*, Fagus ferruginea.)

205. *Chestnut*, Castanea vesca, var. Americana, "chewing chestnut twigs and swallowing the juice will give relief" in heartburn.

MYRICACEAE.—49. *Bayberry*, Myrica cerifera, bark of the root made into a tea an excellent remedy for dysentery, pulverised "an excellent sneezing or headache snuff."

(50. *Meadow Fern*, Comptonia asplenifolia.)

(116. *Sweet Gale*, Myrica Gale.)

BETULACEAE.—51. *Black Birch*, Betula lenta, a tea drunk with milk, a galactagogue and emmenagogue. The sap drunk freely good for gravel, to purify the blood and heal canker in the mouth; as a syrup restorative after dysentery.

206. *Swamp* or *Tag Alder*, Alnus incana, bark in a tea good for all diseases of the skin and as a wash for bad ulcers and sores; the "tags" bark and boughs made into a beer cleanse the blood; as an ointment good for bruises and all inflammations.

SALICACEAE.—(52. *White Poplar*, Populus alba.)

(53. *Stinking Poplar*, Populus balsamifera.)

54. *Balm of Gilead*, Populus balsamifera, var. candicans, the buds with several other ingredients boiled into a syrup and sweetened, an excellent stomachic and strengthening syrup.

207. *Red Rod*, *Red Willow*, Salix purpurea, with several other ingredients in a tea "cleanses the system from all cancerous and scrofulous affections."

CONIFERAE.—56. *Hemlock*, Abies Canadensis, the inner bark with bayberry, ginger, cayenne, etc., for "composition powders" to cure colds, rheumatism, "relax," etc.; also the boughs in a tea with other ingredients good for chlorosis.

55. *Balsam Fir*, Abies balsamea, the balsam cures sore nipples.

208. *White Pine*, Pinus Strobus, the bark made into a tea with Seneca snakeroot, burdock seed and prickly ash bark, good for rheumatism.

209. *Tamarisk* (apparently a misprint for *Tamarack*, as this tree is certainly meant), Larix Americana, bark aperient and corroborant, leaves used in jaundice, bleeding at the lungs, and some skin diseases, ulcers, bruises, dropsy; also an emmenagogue.

117. *Cedar*, Thuja occidentalis, "cedar boughs" an ingredient in a tea for chlorosis.

210. *Savine*, Juniperus Virginiana or J. Sabina, var. procumbens, leaves applied externally in powder or in-

fusion to warts, carious bones and old ulcers, itch, gangrene, and scald head; the oil cures toothache.

128. *Juniper*, Juniperus communis, the oil cures toothache. (These species do not seem to be accurately distinguished by this author.)

ARACEAE.—57. *Skunk Cabbage*, Symplocarpus foetidus, roots and seeds useful in asthma, coughs, consumption, etc.; a good vermifuge when taken in powder.

118. *Wild Turnip, Indian Turnip, Dragon Root, Wake Robin*, etc., Arisaema triphyllum, roots in a tea good for coughs, colds, consumption, cramps in the stomach, quickens the circulation and is a useful stimulant; a poultice made of green roots and leaves useful in scrofula; as an ointment cures scald head.

211. *Sweet Flag*, Acorus Calamus, useful in colic taken as a bitter.

ALISMACEAE.—212. *Water Plantain*, Alisma Plantago, an astringent in dysentery. The Wyandot Indians use it externally for old sores, bruises, and wounds. "The roots boiled and mashed into a poultice remove inflammation, reduce swelling, cleanse and heal the most foul and inveterate ulcers."

ORCHIDACEAE.—119. *Lady's Slipper, Mocassin Flower, Yellow Umbil, American Valerian, Nerve Root*, etc., Cypripedium pubescens (and other species), a nerve tonic useful in nervous irritation, hysteria, spasms, fits, derangement of the brain, madness and delirium, roots infused.

120. *Crawley Root, Fever Root*, Corallorhiza odontorhiza or C. innata, "cannot be given amiss in any species of colic."

IRIDACEAE.—213. *Water Flag, Blue Flag, Flower-de-Luce*, Iris versicolor (and probably other species). "Dr Elisha Smith, formerly President of the Society of Botanic Physicians in New York," considered the root a perfect substitute for mercury for any of its purposes.

CHENOPODIACEAE.—214. *Wormseed*, Chenopodium ambrosioides, oil an anthelmintic. The juice may be administered to children of two or three, or the powdered seeds mixed with molasses.

215. *Garden Beet*, Beta vulgaris, with hoarhound, spikenard, elecampane roots, a honey syrup for coughs and consumption.

LILIACEAE.—(58. *Wake Robin*, Trillium erythrocarpum.)

N.B.—This author calls the Indian Turnip (No. 118) Wake Robin.

121. *Beth Root*, Trillium grandiflorum, the root astringent and tonic; the Indians use it also to cure snakebites.

122. *Red Beth Root*, Trillium erectum, a snuff stops bleeding at the nose.

122. *Unicorn Root, Blazing Star, Star Root*, Helonias bullata, root is used as a tonic and corroborant, an ecbolic and an "excellent female bitter." ("Blazing Star" is in my experience usually applied to the Devil's Bit, No. 216, or to the Liatris Squarrosa or L. cylindriaca.)

216. *Devil's Bit*, Chamaelirium luteum, the root a good astringent and tonic, cures scrofula and makes a good gargle for putrid sore throat (Diphtheria).

127. *Saffron*, Colchicum autumnale, a "stimulant to guard the stomach" in gout.

217. *Dogtooth Violet*, Erythronium Americanum, used as the Iris versicolor (No. 213).

218. *Garlic*, Allium sativum, "two ounces infused in a bottle of Madeira wine and a glassful taken night and morning is a good remedy" for coughs.

219. *Onion*, Allium Cepa, roast in the fire, squeeze out the juice and sweeten with honey, molasses, or sugar," an excellent remedy for coughs in teaspoonful to tablespoonful doses." The juice of red onions is almost a specific for gravel and stone.

123. *Solomon's Seal*, Polygonatum giganteum or P. biflorum, the root a mild and very healing restorative in consumption, general debility, etc., used in syrup, tea, or cordial. The mucilage of the roots is good in inflammation and hæmorrhoids applied as a poultice. (It may be that the author means the *False Solomon's Seal*, Smilacina bifolia, trifolia, stellata or racemosa, all of which I have heard called *Solomon's Seal.*)

GRAMINEAE.—124. *Oats*, Avena sativa, a fomentation made of oats fried in vinegar used in colic applied to the pit of the stomach.

220. *Wheat*, Triticum vulgare, used in flour; also the bran stirred in coffee, tea, or milk a certain remedy for costiveness.

221. *Indian Corn,* Zea Mays, the meal used as a poultice covered with young hyson tea laid on burns will generally perform a cure by one application.

FILICES.—125. *Winter Brake,* Pteris aquilina, a powerful astringent, "good to bind blood vessels and to prevent the leaking of sinews."

There is not much, if any, doubt as to the foregoing identifications; I am not sure of the following.

222. *Sciatica Cresses,* Nasturtium palustre of the CRUCIFERAE made into a salve with lard and applied to the hip will cure sciatica and gout, equally effective in rheumatism.

223. *Tory Weed, Canada Burr,* Desmodium of various species of the LEGUMINOSAE, the leaves allay inflammation and extract "the soreness and virulence from irritated, galled or bruised parts."

(This may be Bidens frondosa of the COMPOSITAE.)

I cannot even guess at *Rupturewort, Camwood, High Wickup, Septfoil, Vine Maple, Castor.*

No more than the writers formerly quoted does this writer confine himself to native plants, although the whole system is based upon the theory that the Almighty has provided in the plants of a country a complete remedy for any disease which can appear in the country. Nor indeed are remedies from the animal or even the mineral kingdom excluded.

Of exotic plants we find young hyson tea, copaiva (the balsam), coffee, cinnamon, ginger, camphor, assafoetida, myrrh, black pepper, nutmegs, guiacum, galbanum, bergamot, cardamon, aloes, allspice, mace, cloves, jalap, cork (the ashes), olive (the oil). Certain vegetable products are also used, gin, rum, brandy, "spirits," turpentine, charcoal, rosin, white rosin, molasses, sugar, tar, black pitch, port wine, vinegar, castile soap, pearl ash.

The animal kingdom is drawn upon for honey, lard, eggs, yellow wax, suet (beef and mutton) spermaceti, beef's gall, black snake's skin ("procure a black snake's skin and tie it round the patient's waist, the flesh side next to the skin, and wear it continually," a perfect preventative against epileptic fits, cramps, and convulsions). Rattlesnake oil ("rattlesnake's oil, four or five drops given on sugar has saved life when the breath was almost totally

stopped" with croup. "It cuts up the phlegm and frees the passages almost instantaneously," and is equally effective in "hooping cough"). Fishworms ("an ointment of fishworms simmered in linseed oil till they crisp and the liquid applied is very powerful in cases of rheumatism").

The mineral kingdom supplies quicklime, caustic potash, ammonia, sal ammoniac, verdigris, alum, chalk, magnesia, rock salt, copperas, saleratus, sulphur, borax.

While our author was a Botanical Physician, he was not bigoted.

Additions to the Flora of Orkney, as recorded in Watson's "Topographical Botany," Second Edition (1883). By Colonel H. H. Johnston, C.B., C.B.E., D.Sc., F.R.S.E., F.L.S.

(Read 10th June 1920.)

This paper forms a continuation of two papers on the same subject, one of which I read before the Scottish Natural History Society on 4th April 1895, and which was published in "The Annals of Scottish Natural History," July 1895, and the other before the Botanical Society of Edinburgh on 15th January 1914, and which was published in the Society's "Transactions," vol. xxvi, pp. 207–217 (1914). Most of the plants mentioned in this paper were collected by me during the years 1914, 1916, and 1919.

Before and after the publication of the second edition of Watson's "Topographical Botany," in 1883, several of the plants mentioned in the following list have been recorded from Orkney by me and other botanists; but, as the value of botanical records is greatly enhanced by the possession of authentic specimens, I have included in this list the names of all specimens in my herbarium, which are either additional to or confirm doubtful records of the plants recorded from County No. 111 Orkney in the second edition of the above-mentioned book.

In the case of those plants which have already been recorded from Orkney, references are given in the following list, under each species and variety, to the books in which

the records have been published. These records are principally contained in "A Tour through some of the Islands of Orkney and Shetland," in the year 1804, by Patrick Neill (1806); "Notice of some of the rarer Plants observed in Orkney during the Summer of 1849," by John T. Syme, Esq., published in the "Transactions of the Botanical Society of Edinburgh," vol. iv, pp. 47–50 (1850); "Florula Orcadensis—A list of plants reported to occur in the Orkney Isles," by H. C. Watson, Esq., F.L.S., published in the "Journal of Botany," No. xiii, pp. 11–20 (January 1864); Annual Reports of the Botanical Exchange Club of the British Isles; "A new List of the Flowering Plants and Ferns of Orkney," edited by W. A. Irvine Fortescue, and published in "The Scottish Naturalist" (1882–1884); "Supplement to Topographical Botany, ed. ii," by Arthur Bennett, A.L.S. (1906); and "Flora Orcadensis," by Magnus Spence, F.E.I.S. (1914).

The nomenclature followed is that of the second edition of Watson's "Topographical Botany" (1883), except in the case of species and varieties which are not recorded in that work. In the latter case the nomenclature adopted is that of "The London Catalogue of British Plants," tenth edition (1908). Non-native plants, which have become naturalised in Orkney, are distinguished by a * prefixed to the names, and the names of casuals are printed in italics.

Of the 54 species and varieties recorded from Orkney in the following list, 36 are native, 6 are naturalised, and 12 are mere casuals introduced into Orkney through the agency of cultivation.

ABBREVIATIONS.

"Annals Scot. Nat. Hist." = The Annals of Scottish Natural History.

Bennett, "Suppl. Top. Bot." = Supplement to H. C. Watson's Topographical Botany, second edition. By Arthur Bennett, A.L.S. (1905).

"Bot. Exch. Club Report" (separate Reports by the Secretary and Distributor) = Report of The Botanical Exchange Club of the British Isles, at present called The Botanical Exchange Club and Society of the British Isles

"Journ. Bot." = The Journal of Botany.

"Lond. Cat." = The London Catalogue of British Plants.

Neill, "Tour" = A Tour through some of the Islands of Orkney and Shetland, in the year 1804. By Patrick Neill, A.M., Secretary to the Natural History Society of Edinburgh (1806).

"Scot. Nat." = The Scottish Naturalist.
Spence, "Flora Orcadensis" = Flora Orcadensis, by Magnus Spence, F.E.I.S. (1914).
Watson, "Top. Bot." = Topographical Botany, second edition. By H. C. Watson (1883).

Corrections.

In "Annals Scot. Nat. Hist.," July 1895, p. 176, *for* "ALCHEMILLA VULGARIS, *Linn.*, *var.* MONTANA," *read* ALCHEMILLA MINOR, *Huds.*, *subsp.* FILICAULIS, *Lindberg* (*fide* E. F. Linton). [= A. VULGARIS, *Linn. var. c.* FILICAULIS (*Buser*), of "Lond. Cat.," ed. x, (1908).]

In "Trans. Bot. Soc. Edin.," vol. xxvi, p. 209 (1914), *for* "ROSA CANINA, *Linn.*, *var.* SPHAERICA (*Gren.*) (*fide* J. G. Baker)," *read* ROSA GLAUCA, *Vill.*, *var. d.* TRANSIENS (*Kern.*) (*fide* W. Barclay); and *for* "ROSA GLAUCA, *Vill.*, *var.* CRÉPINIANA (*Déségl.*) (*fide* J. G. Baker)," *read* ROSA TOMENTOSA, *Sm.* (*fide* W. Barclay).

[The same corrections should be made in Spence, "Flora Orcadensis," pp. 128 and 129 (1914).]

In "Trans. Bot. Soc. Edin.," vol. xxvi, p. 219 (1914), *for* "ROSA CANINA, *Linn.*, *var.* LUTETIANA (*Léman*) (*fide* J. G. Baker)," *read* as follows:—(1) ROSA GLAUCA, *Vill.*, *var. a.* REUTERI (*Godet*) (*fide* W. Barclay). Crags at burnside, Wart Hill, Hoy, 28th August 1883, H. H. Johnston [the same correction should be made in "Annals Scot. Nat. Hist.," July 1895, p. 176]; and rare on banks at burnside, 240 feet above sea-level, The Dale, between the Hill of Miffia and Cringla Fiold, Stromness, Mainland, 26th August 1912, H. H. Johnston; and (2) ROSA GLAUCA, *Vill.*, *var. e.* SUBCRISTATA (*Baker*) (*fide* W. Barclay). Common on grassy cliffs at the seashore, 10 feet above sea-level, west side of Aith Hope, Waas, Hoy, 4th August 1913, H. H. Johnston. Native at all these three stations.

In "Annals Scot. Nat. Hist.," July 1895, p. 176, in line 18 from top of page, *for* "*Var.* DUMALIS (*fide* J. G. Baker)," *read var.* SUBCRISTATA (*fide* W. Barclay). [The same correction should be made in "Bot. Exch. Club Report for 1880," p. 31 (1881), in line 9 from top of page—the late Dr J. T. I. B. Boswell's record for this plant from Lerquoy Burn, Orphir, Mainland, in 1875.]

In "Trans. Bot. Soc. Edin.," vol. xxvi, p. 211 (1914), *for*

"HIERACIUM SILVATICUM, *Gouan, var.* TRICOLOR, *W. R. Linton* in "An Account of the British Hieracia," 1905, p. 39," *read* HIERACIUM RUBICUNDUM, *F. J. Hanbury, var. b.* BOSWELLI (*Linton*), in "Journ. Bot.," vol. xxxi, June 1893, pp. 178 and 179 (as a species). [A similar correction should be made in Spence, "Flora Orcadensis," p. 131 (1914).]

In "Annals Scot. Nat. Hist.," July 1895, p. 181, in line 3 from bottom of page, *for* "Native" *read* Not native. [The Timothy-grass is cultivated in Orkney, and I have only seen it growing in cultivated fields, or on the borders of cultivated land.]

CLASS I.—DICOTYLEDONS.

RANUNCULUS DIVERSIFOLIUS, *Gilib., var. b.* GODRONII (*fide* J. Groves).—Mud at bottom of shallow water in a small loch, 10 feet above sea-level, Tarf Loch, Swona, 28th July 1914, Henry Halcro Johnston; and swamp near the centre of the island, 50 feet above sea-level, Swona, 28th July 1914, H. H. Johnston. Native and rare at both stations.

RANUNCULUS HEDERACEUS, *Linn.* (name confirmed by J. Groves).—Mud in bed of a small dried-up pool of water, 110 feet above sea-level, near Backaquoy, north of Castle of Burwick, South Ronaldsay, 20th July 1914, H. H. Johnston; and mud in a ditch, 10 feet above sea-level, Burwick Loch (now a swamp), South Ronaldsay, 20th July 1914, H. H. Johnston. Native and rare at both stations. See "Scot. Nat.," No. xlvii, July 1882, p. 321, where this species is recorded from Papa Westray, by A. R. Duguid, and Quendale in Rousay, by R. Heddle.

COCHLEARIA GROENLANDICA, *Linn.* (*fide* Arthur Bennett). —Short natural pasture near edge of sea cliffs, 250 feet above sea-level, Black Craig, Stromness, Mainland, 26th May, 10th July, and 4th August 1919, H. H. Johnston. Native. Common. Stem leaves stalked. Petals pale purplish-white, or more rarely white, in different plants. Fruit obovoid, or globose-obovoid, glabrous, wrinkled, brown; persistent style short, glabrous, brown. Confirms the record of this species from Orkney in "Guide to the Orkney Islands" by Rev. Charles Clouston, p. 58 (1862),

and that of the Rev. E. S. Marshall from the Black Craig, Stromness, Mainland, in "Journ. Bot.," vol. xxxix, August 1901, p. 267.

Reseda lutea, Linn.—Gravelly ground round filter beds, Kirkwall Waterworks Reservoir, near Hatston, Saint Ola, Mainland, 31st August 1916, H. H. Johnston. Not native. One plant only seen by me.

CERASTIUM SUBTETRANDRUM, *Murbeck* (*fide* Arthur Bennett).—Turf on igneous rocks, 10 feet above sea-level, Black Holm, near Copinsay, 22nd August 1916, H. H. Johnston. Native. Common. Sepals 4 or 5, petals 4 or 5, and capsule slightly curved or nearly straight, with 8–10 teeth, in the same plant. With reference to my specimens of this plant, Mr Arthur Bennett, in a note dated 7th November 1919, writes: "Not *tetrandrum*—sepals acute and capsule nearly straight; or it might be *pentandrum*, a variety of *triviale*, but I think not. The length of the capsule will not do for *tetrandrum*. It seems to me to agree fairly well with Lindman's figure of *C. subtetrandrum*, Murbeck, = *C. pumilum*, Curt., *var. s.* Lange." A new record for this species for H. C. Watson's county No. 111 Orkney.

SAGINA APETALA, *Ard.* (*fide* Arthur Bennett).—Natural turfy pasture at seashore, 10 feet above sea-level, Ayre Loch, Copinsay, 22nd August 1916, H. H. Johnston. Native. [I have a specimen of SAGINA MARITIMA, *Don* (*fide* Arthur Bennett), collected by me at the same station and on the same date.] Confirms the record of this species for H. C. Watson's county No. 111 Orkney, by Mr Patrick Neill in his "Tour," p. 185 (1806).

Claytonia siberica, Linn. (name confirmed by Arthur Bennett).—Roadside, 150 feet above sea-level, Binscarth, Firth, Mainland, 6th September 1919, H. H. Johnston. Not native. Escape from Binscarth plantation of trees.

Ononis arvensis, Linn. [= *O. repens*, Linn.] (*fide* Arthur Bennett).—Roadside, 25 feet above sea-level, Skaill, Sandwick, Mainland, 6th August 1919, H. H. Johnston. Not native. Rare. Petals pink. On visiting Skaill on 27th September 1919 I found no fruit on the growing plants. See "Annals Scot. Nat. Hist.," No. 26, April 1898, p. 105; and "Trans. Bot. Soc. Edin.," vol. xxvii, p. 55 (1916).

Melilotus officinalis, Willd. [=*M. altissima*, Thuill.]—Gravelly ground round filter beds, 260 feet above sea-level, Kirkwall Waterworks Reservoir, near Hatston, Saint Ola, Mainland, 31st August 1916, H. H. Johnston. Not native. Common. Petals yellow. See Spence, "Flora Orcadensis," p. 19 (1914), where this species is recorded from Quoybelloch in Deerness, and Saint Ola, both in Mainland, and "introduced in both cases." Dr. J. S. Flett reported it from Orkney in 1890.

Lotus major, Scop. [=*L. uliginosus*, Schkuhr.] (*fide* Arthur Bennett).—Pasture near a turnip field, 120 feet above sea-level, junction of the Kirkwall-Stromness Road and Firth-Harray Road, Binscarth, Firth, Mainland, 5th August 1914, H. H. Johnston. Not native. Rare. The fruit did not ripen in 1914, the pods being still unripe on 6th October 1914.

*Lupinus nootkatensis, *Donn.*—Heath, 200 feet above sea-level, Swanbister, Orphir, Mainland, 6th June and 17th August 1914, H. H. Johnston; heathery hillside, 180 feet above sea-level, Grindally, Midland Hill, Orphir, Mainland, 9th June and 15th August 1914, H. H. Johnston; heath, 140 feet above sea-level, Hillside, Stromness, Mainland, 31st May and 11th July 1919, H. H. Johnston; heath, 230 feet above sea-level, Redland Hill, Stromness, Mainland, 15th August 1919, H. H. Johnston; grassy banks at burnside, 60 feet above sea-level, Beaquoy, Birsay, Mainland, 9th July 1919, H. H. Johnston; and heath, 120 feet above sea-level, Hobbister, Stenness, Mainland, 15th July and 18th August 1919, H. H. Johnston. Naturalised and common at all these six stations, where the Lupines are exterminating the native plants. See "Trans. Bot. Soc. Edin.," vol. xvi, p. 166 (1884); "Bot. Exch. Club Report for 1886," p. 146 (1887); "Scot. Nat.," No. xvii, new series, July 1887, p. 129; "Annals Scot. Nat. Hist.," July 1895, p. 176; and *ibid.*, No. 26, April 1898, p. 105, in all of which books this species is erroneously recorded as "LUPINUS PERENNIS, *Linn.*" See also "Trans. Bot. Soc. Edin.," vol. xxvi, p. 208 (1914); and Spence, "Flora Orcadensis," p. 16 (1914).

ALCHEMILLA MINOR, *Huds. subsp.* FILICAULIS, *Lindberg* (*fide* E. F. Linton) [=A. VULGARIS, *Linn., var. c.* FILI-

CAULIS (*Buser*), of "Lond. Cat.," ed. x (1908)].—Hilly pasture and burnside, Midland Hill, Orphir, Mainland, 29th July 1876 and 5th June 1877, respectively, H. H. Johnston. Native. The same specimens were identified as "A. VULGARIS, *Linn., var. b.* MONTANA, *Willd.*," by the late Dr. J. T. I. B. Boswell, but the Rev. E. F. Linton informs me that the *var.* MONTANA, *Willd.*, is not found in Great Britain. See "Annals Scot. Nat. Hist.," July 1895, p. 176; and "Journ. Bot.," vol. lii, November 1914, p. 228, in which "A. MINOR, *Huds., var.* filicaulis, *Buser*," is recorded for H. C. Watson's county No. 111 Orkney.

ROSA MOLLIS, *Sm. var. c.* COERULEA, *Woods* (*fide* W. Barclay).—Banks at burnside, Mill Burn, Hoy, 20th August 1885, H. H. Johnston. Native. Confirms the record of this variety from Orkney (South Burn of Quoys, Hoy) by Dr. J. T. I. B. Boswell, in "Bot. Exch. Club Report for 1880," p. 30 (1881). See "Scot. Nat.," No. xlviii, October 1882, p. 363; and Spence, "Flora Orcadensis," p. 21 (1914).

ROSA GLAUCA, *Vill., var. d.* TRANSIENS (*Kern.*) (*fide* W. Barclay).—Heathery banks at burnside, 180 feet above sea-level, Berriedale, Hoy, 4th November 1913, H. H. Johnston. Native. The same specimen was identified as "R. CANINA, *Linn., var. c.* SPHAERICA (*Gren.*)" by Mr. J. G. Baker, and so recorded by me in "Trans. Bot. Soc. Edin.," vol. xxvi, p. 209 (1914); and in Spence, "Flora Orcadensis," p. 128 (1914). See "CORRECTIONS."

EPILOBIUM PARVIFLORUM, *Schreb.* (*fide* Arthur Bennett).—Wet ditch, 120 feet above sea-level, Upper Braebuster, Deerness, Mainland, 19th August 1916, H. H. Johnston. Native. Very rare. Confirms Dr. Macnab's record of this species for H. C. Watson's county No. 111 Orkney. See "Scot. Nat.," No. xlviii, October 1882, p. 364; Bennett, "Suppl. Top. Bot.," p. 35 (1906); and Spence, "Flora Orcadensis," p. 23 (1914).

*Epilobium hirsutum, *Linn.* (name confirmed by Arthur Bennett).—Mud at bottom of shallow running water in a burn, 5 feet above sea-level, Newhouse, Clestrain, Orphir, Mainland, 21st August 1914. Naturalised. Common. No fruit developed in 1914, there being only undeveloped ovaries on the plants growing at this station on 2nd

October 1914. Mr. Peter Goudie, Newhouse, informed me, on 21st August 1914, that this plant escaped from his garden at Newhouse about or before 1908, since which time it has become thoroughly naturalised in the burn between his house and the mouth of the burn at the sea-shore. Confirms the record of this species from Orkney in "History of the Orkney Islands," by Rev. Dr. Barry, ed. ii, p. 280 (1808). See "Trans. Bot. Soc. Edin.," vol. xxvii, p. 55 (1916).

SAXIFRAGA STELLARIS, *Linn.* (name confirmed by Arthur Bennett).—Wet, mossy rocks on hillside, 500 feet and 800 feet above sea-level, Hoy, 15th June and 11th September 1914, H. H. Johnston. Native. Very rare. See "Scot. Nat.," No. xlviii, October 1882, p. 365; and Spence, "Flora Orcadensis," p. 25 (1914).

*Carum Carui, *Linn.* (name confirmed by Arthur Bennett).—Old artificial pasture, 70 feet above sea-level, Biggings, North Parish, South Ronaldsay, 29th July 1914, H. H. Johnston. Naturalised. Common. This species was found in "meadows below Cletts," near Biggings, South Ronaldsay, by R. Heddle, prior to 1858, and it has grown there, flowering and fruiting freely ever since. See "Scot. Nat.," No. xlviii, October 1882, p. 365; and Spence, "Flora Orcadensis," p. 27 (1914).

SIUM ANGUSTIFOLIUM, *Linn.* [=S. ERECTUM, *Huds.*] (name confirmed by Arthur Bennett).—Marshy burnside, 10 feet above sea-level, Burn of Sutherland, Burray, 27th July 1914, H. H. Johnston. Native. Common. Confirms the record of this species from Orkney by Mr. Patrick Neill in his "Tour," p. 185 (1806). See "Journ. Bot.," No. xiii, January 1864, p. 20; "Scot. Nat.," No. xlviii, October 1882, p. 366; Bennett, "Suppl. Top. Bot.," p. 42 (1906); and Spence, "Flora Orcadensis," p. 28 (1914). Removes "[111 Neill, 'common']" from among the "supposed errors" in Watson, "Top. Bot.," ed. ii, p. 193 (1883).

Scandix Pecten-Veneris, Linn.—Rousay, 1847, Robert Heddle; corn-field, Hoy, 9th July 1877, H. H. Johnston; and potato-field and turnip-field, Myrland, Deerness, Mainland, 23rd August 1916, H. H. Johnston. Not native. A weed of cultivation. Confirms the record of this species from Orkney in "History of the Orkney

Islands," by Rev. Dr. Barry, ed. ii, p. 279 (1808). See "Journ. Bot.," No. xiii, January 1864, p. 14; "Scot. Nat.," No. xlviii, October 1882, p. 366; and Spence, "Flora Orcadensis," p. 30 (1914).

Galium Mollugo, Linn., var. c. *Bakeri*, Syme (*fide* Arthur Bennett).—Patch of artificial pasture, 4 feet long by 3 feet broad, left unploughed in a *bere* (barley) field by Mr. William Delday to prevent the extinction of this plant, 160 feet above sea-level, Quoybelloch, Deerness, Mainland, 19th August 1916; and rare on a grassy bank at roadside, 55 feet above sea-level, Downatown, Birsay, Mainland, 22nd September 1919, H. H. Johnston. Not native. A weed of cultivation. Leaves 6 in a whorl. Corolla white.

Crepis virens, Linn. [= *C. capillaris*, Wallr.] (*fide* Arthur Bennett).—Artificial grass-field, 10 feet above sea-level, Garson, Stromness, Mainland, 5th September 1919, H. H. Johnston. Not native. A weed of cultivation. Common. Confirms the record of this species under the name of "CREPIS *Tectorum*," Sm., in "History of the Orkney Islands," by Rev. Dr. Barry, ed. ii, p. 285 (1808). See "Journ. Bot.," No. xiii, January 1864, p. 14; Bennett, "Suppl. Top. Bot.," p. 47 (1905); and Spence, "Flora Orcadensis," p. 41 (1914).

HIERACIUM RUBICUNDUM, *F. J. Hanbury, var. b.* BOSWELLI (*Linton*) in "Journ. Bot.," vol. xxxi, June 1893, pp. 178 and 179 (as a species) (*fide* E. F. Linton, 30th October 1914. See "CORRECTIONS").—Crags on hillside. 430 feet above sea-level, Dwarfie Hamars, Hoy, 22nd July 1912, H. H. Johnston. Native. On 20th September 1912 the same specimens were doubtfully identified as H. SILVATICUM, *Gouan, var. c.*, TRICOLOR, *W. R. Linton*, or *var. e.* ASYMMETRICUM, Ley, by the Rev. E. F. Linton, and they were recorded by me as *var. c.* TRICOLOR, *W. R. Linton*, in "Trans. Bot. Soc. Edin.," vol. xxvi, p. 211 (1914); and in Spence, "Flora Orcadensis," p. 131 (1914). With reference to these specimens, the Rev. E. F. Linton furnished me with the following written note, dated 30th October 1914, viz.:—"Not var. *tricolor*. May be var. *asymmetricum*, Ley, but has very hairy leaves for that. It has much the resemblance of my *H. rubicundum*, var.

Boswelli, which the hairs and ciliation suit better, but you reported yellow style. I am much inclined to place it with the last named." At the time I collected my specimens, on 22nd July 1912, I recorded the colour of the style and its branches as "yellow," but on examining the *dried* specimens in my herbarium, I find that the specimens are yellowish-brown, whereas the corollas remain bright yellow. In "An Account of the British Hieracia," by Rev. W. R. Linton, p. 25 (1905), the colour of the styles of H. RUBICUNDUM, *F. J. Hanbury*, is recorded as "yellowish or light olive"; but in the case of all my specimens of the type of that species, collected in the three islands of Hoy, Mainland, and Rousay, and also in the case of the *var. b.* BOSWELLI (*Linton*), collected at the Dwarfie Hamars, Hoy, the styles and their two branches were recorded by me as "yellow" in the living plants, and they have all turned yellowish-brown during the drying of the specimens, whereas the colour of the corollas still remain bright yellow in the dried specimens. If the name *var. b.* BOSWELLI (*Linton*) is correct, my record confirms that for this variety from Orkney in "An Account of the British Hieracia," by Rev. W. R. Linton, p. 25 (1905). My specimens were collected at the same stations as those (rather poor specimens) collected by the late Rev. W. R. Linton, at the Dwarfie Hamars, Hoy, on 10th August 1886, and which his brother, the Rev. E. F. Linton, thinks may be the *var. b.* BOSWELLI (*Linton*). See my "Note" on H. RUBICUNDUM, *F. J. Hanbury*, in "Trans. Bot. Soc. Edin.," vol. xxvi, p. 210 (1914); and "Annals Scot. Nat. Hist.," No. 58, April 1906, p. 95.

HIERACIUM RIVALE, *F. J. Hanbury, var. b.* DASYTHRIX, *Linton* in "Journ. Bot.," vol. xxxi, June 1893, p. 178 [=H. PICTORUM, *Linton, var.* DASYTHRIX, *Linton*] (*fide* E. F. Linton).—Crags in a glen, 280 feet above sea-level, Berriedale, Hoy, 7th September 1914, H. H. Johnston. Native. Style and its two branches yellowish-brown. A new record for this variety for H. C. Watson's county No. 111 Orkney.

HIERACIUM SARCOPHYLLUM, *Stenstr., var. c.* EXPALLIDIFORME, *Dahlst.* in "Stenstr. Värn. Archier.," 18 (1889), as a species; "Bidr. t. Syd. Sver. Hier.," ii, 174 (1893), as a

variety (*fide* E. F. Linton).—Crags on hillside, 750 feet above sea-level, south side of the Meadow of the Kame, Hoy, 11th September 1914, H. H. Johnston. Native. Style and its two branches yellowish-brown. Confirms the record of this variety from Hoy, Orkney, in "An Account of the British Hieracia," by Rev. W. R. Linton, p. 55 (1905). See also "Annals Scot. Nat. Hist.," No. 58, April 1906, p. 97; and "Trans. Bot. Soc. Edin.," vol. xxvii, p. 55 (1916).

Carduus arvensis, Curt. var. b. *setosus* (Bess.) (*fide* Arthur Bennett).—Gravelly ground round filter beds, 260 feet above sea-level, Kirkwall Waterworks Reservoir, near Hatston, Saint Ola, Mainland, 31st August 1916, H. H. Johnston. Not native. Rare. Corolla purple. See "The Student's Flora of the British Islands," by Sir J. D. Hooker, ed. i, p. 192 (1870); "Scot. Nat.," No. xlviii, October 1882, p. 367; Spence, "Flora Orcadensis," p. 39 (1914); and "Trans. Bot. Soc. Edin.," vol. xxvii, p. 56 (1916).

SENECIO JACOBAEA, *Linn., var. b.* DISCOIDEUS, *Linn.* [= *var. b.* FLOSCULOSUS (*Jord.*)] (*fide* Arthur Bennett).—Natural shell-sandy pasture, 30 feet above sea-level, Links of Booth, Newark Bay, Deerness, Mainland, 19th August 1916, H. H. Johnston. Native. This variety, without ray florets, is much less common than the type of the species, with large and small ray florets on different plants, growing at the same station, and of which latter I also have specimens in my herbarium, collected by me at the same station and on the same date.

GENTIANA CAMPESTRIS, *Linn., subsp.* BALTICA, *Murbeck* (*fide* Arthur Bennett).—Pasture near the seashore, 20 feet above sea-level, Swona, 28th July 1914, H. H. Johnston, calyx lobes 4, 2 large and 2 small, corolla purple; and short natural pasture near edge of sea-cliffs, 180 feet above sea-level, Black Craig, Stromness, Mainland, 4th August and 5th September 1919, H. H. Johnston, corolla dark purple. Native and common at both stations. See "Trans. Bot. Soc. Edin.," vol. xxvi, p. 221 (1914); and Spence, "Flora Orcadensis," pp. 49 and 132 (1914).

Convolvulus arvensis, Linn.—Gravelly ground round filter beds, 260 feet above sea-level, Kirkwall Waterworks

Reservoir, near Hatston, Saint Ola, Mainland, 31st August 1916, H. H. Johnston. Not native. Rare. Corolla pink. Confirms the record of this species from Orkney in Neill, "Tour," p. 185 (1806). See "Journ. Bot.," No. xiii, January 1864, p. 15; and Spence, "Flora Orcadensis," p. 50 (1914).

EUPHRASIA OCCIDENTALIS, *Wettst.* (*fide* Cedric Bucknall). —Pasture at seashore, 5 feet above sea-level, Swona, 28th July 1914, H. H. Johnston. Native. Common. Cauline leaves 2–8 toothed. Corolla light purple, with darker purple lines, and a yellow spot on throat of lower lip. The same specimens were seen by the late Rev. E. S. Marshall, who wrote the following note on them, on 3rd September 1914, viz.:—"Forms of *E. curta*, I think, with large flowers. Some are hairy enough for type; others come nearer to var. *glabrescens*." But, on 18th October 1919, Mr. C. Bucknall wrote: "Not *Euphrasia curta*, as the leaves and bracts are very glandular.' This species and E. BOREALIS, *Townsend* (*fide* C. Bucknall) both grow at the same station in Swona, and I have specimens of both, collected by me on the same date, in my herbarium.

EUPHRASIA LATIFOLIA, *Pursh* (*fide* C. Bucknall).—Natural heathery and grassy pasture, 90 feet above sea-level, Black Craig, Stromness, Mainland, 4th August and 5th September 1919, H. H. Johnston. Native. Common. Cauline leaves 2–6-toothed. Corolla pale lilac, with dark purple lines, and a yellow spot on throat of lower lip. A large number of living and dried specimens of this species were sent by me to Mr. Cedric Bucknall, who sent me the following written note, dated 18th October 1919, viz.:—"*Euphrasia latifolia*, Pursh. These specimens agree with Wettstein's description in bearing a few stipitate glands on the leaves and bracts. Having been gathered rather late in the season, they lack the large stem leaves with broad, obtuse terminal lobe which is so characteristic of *E. latifolia*, and being glandular they might easily be taken for *E. occidentalis*. This actually happened to a sheet of specimens from the same locality in Herb. Druce, gathered in 1912, which were variously named *E. curta*, *E. borealis*, and *E. occidentalis*. I have no doubt that

these were the same as the present 1919 gathering, and I have no hesitation in naming them all *E. latifolia*." In the case of the specimens of EUPHRASIA collected by me at the Black Craig, Stromness, Mainland, on 19th August 1912, and distributed that year through the Botanical Exchange Club of the British Isles, the name EUPHRASIA LATIFOLIA, *Pursh* (*fide* C. Bucknall), should, therefore, be substituted for the following ones, viz.: (1) "*Euphrasia curta*, Wettst. (*fide* E. S. Marshall)," in "Bot Exch. Club Distributor's Report for 1912," p. 273 (1913); (2) "*Euphrasia borealis*, Townsend (*fide* E. S. Marshall)," in "Bot. Exch. Club Distributor's Report for 1913," p. 516. (1914), "Trans. Bot. Soc. Edin.," vol. xxvi, p. 213 (1914), and Spence, "Flora Orcadensis," p. 133 (1914); and (3) "*Euphrasia occidentalis*, Wettst.," in "Bot. Exch. Club Secretary's Report for 1916." p. 497 (1917). See Messrs. W. H. Pearsall and D. Lumb's remarks in "Bot. Exch. Club Distributor's Report for 1916," p. 598 (1917), in which they state, with reference to my specimens collected at the Black Craig, Stromness, Mainland, on 19th August 1912, that "assisted by Mr Pugsley, we have come to the conclusion that *latifolia* is the more nearly correct name." My record of E. LATIFOLIA, *Pursh*, from the Black Craig, confirms that of the late Rev. E. S. Marshall for the same station, in "Journ. Bot.," vol. xxxix, August 1901, p. 270. See "Trans. Bot. Soc. Edin.," vol. xxvii, p. 56 (1916).

SCROPHULARIA NODOSA, *Linn.* (name confirmed by Arthur Bennett).—Heathery and ferny banks on north side of a glen, 350 feet above sea-level, Hoy, 19th and 27th June and 9th September 1914, H. H. Johnston. Native. Very rare. This species is, no doubt, the plant erroneously recorded as "SCROPHULARIA *Aquatica*. In Hoy, on banks of rills," in "History of the Orkney Islands," by Rev. Dr. Barry, ed. ii, p. 283 (1808). *S. aquatica*, Linn., grows in England and the south of Scotland, but it is included among the "OMITTED SPECIES" in H. C. Watson's "Florula Orcadensis," published in "Journ. Bot.," No. xiii, January 1864, pp. 11–20. S. NODOSA, *Linn.*, was recorded from the "Burn of Redland, Firth, and Burn above Church of Firth," Mainland, by the late Dr. A. R. Duguid, prior to 1858, but it has not been found at either of these two stations by

me or the late Mr. Magnus Spence. See "Scot. Nat.," No. xlviii, October 1882, p. 372; Spence, "Flora Orcadensis," p. 50 (1914); and "Trans. Bot. Soc. Edin.," vol. xxvii, p. 56 (1916).

* Mentha viridis, *Linn.* [=M. spicata, *Linn.*] (*fide* Arthur Bennett).—Wet, gravelly, and stony burnside, 90 feet above sea-level, Breibuster Burn, Hoy, 8th September 1914, H. H. Johnston. Naturalised. Very rare. Plants neither in flower nor in fruit. Mrs. Georgina Manson, Murra, Hoy, informed me, on 8th September 1914, that, about the year 1874, she saw the Spearmint growing in the *kail-yard* (cabbage garden) at Slack, higher up the side of Breibuster Burn from the place where this plant now grows. This plant therefore appears to have escaped from cultivation and become naturalised at the burnside below the farmhouse of Slack.

* Mentha piperita, *Linn., var. a.* officinalis (*Huds.*) (*fide* Arthur Bennett).—Swamp, 60 feet above sea-level, Little Ocklester, below and north-east of Newhouse, Holm, Mainland, 26th August 1916, H. H. Johnston. Naturalised. Rare. Plants in flower-bud only, and the fresh leaves have the characteristic odour of Peppermint. On the same date, and in the same neighbourhood, I saw a large clump of plants of the same species, in flower-bud, growing in a swamp, 80 feet above sea-level, below and north-east of Thistlequoy, Holm, Mainland; and I also saw it growing at the side of a ditch in the corn stack-yard of the farm of Thistlequoy, where, Mr. James Sutherland, Thistlequoy, informed me, on 26th August 1916, it has grown for many years past. The Peppermint does not occur in the garden at Newhouse. My record of this species from Little Ocklester confirms that of the late Mr. Magnus Spence from the same station, in his "Flora Orcadensis," p. 54 (1914); but, in my opinion, the Peppermint, which is cultivated in gardens in Orkney, has escaped from cultivation and become naturalised at Little Ocklester and Thistlequoy, both in the parish of Holm, Mainland.

THYMUS SERPYLLUM, *Linn., var. b.* PROSTRATUS, Hornem (*fide* Arthur Bennett).—Bare stony hill-top, 400 feet above sea-level, small conical hill north of Sandy Loch, Hoy. 23rd June 1914, H. H. Johnston, plants in flower, with

procumbent rooting stems, and leaves with bristly margins; and grassy cliffs at seashore, 10 feet above sea-level, Head of Holland, Saint Ola, Mainland, 2nd September 1916, H. H. Johnston, plants mostly in unripe fruit, a few in flower, with the upper surface of the leaves and persistent calyx of the unripe fruits densely clothed with long white hairs. Native and common at both stations. My record confirms that of the late Rev. E. S. Marshall for this variety from Orkney (Sandwick, Mainland), in "Journ. Bot.," vol. xxxix, August 1901, p. 270. See also "Annals Scot. Nat. Hist.," No. 59, July 1906, p. 177; and Spence, "Flora Orcadensis," p. 54 (1914), where he states that he thinks he has never seen THYMUS SERPYLLUM, *Linn.*, in the East Mainland, but the Head of Holland is in it.

Nepeta hederacea, Trev. [= *N. Glechoma*, Benth.] (name confirmed by Arthur Bennett).—Artificial pasture in a garden, 80 feet above sea-level, Hall of Clestrain, Orphir, Mainland, 14th June 1919, H. H. Johnston. Not native. A garden weed. Rare. Corolla bluish-purple. Confirms the record of this species from Orkney by Mr. Patrick Neill in his "Tour," p. 187 (1806). See "Glechoma hederacea" in "Journ. Bot.," No. xiii, January 1864, p. 15; and Spence, "Flora Orcadensis," p. 54 (1914).

*Myosotis palustris, *With.* [= M. scorpioides, *Linn.*] (*fide* Arthur Bennett).—Marshy burnside, 20 feet above sea-level, Skaill Burn, Sandwick, Mainland, 25th July 1919, H. H. Johnston. Naturalised and common at Skaill Burn *below* a small garden, in which this species grows and from which it has escaped, at the bridge where the approach road to Skaill House crosses the burn. *Above* the garden, between the bridge and the loch of Skaill, I saw no plants of this species growing along the burnside; but it is common below the garden, between the bridge and the sea at Skaill Bay. Myosotis palustris, *With.*, is included among the "OMITTED SPECIES" in H. C. Watson's "Florula Orcadensis," published in "Journ. Bot.," No. xiii, January 1864, pp. 11–20. MYOSOTIS PALUSTRIS, *With.*, *var. b.* STRIGULOSA (*Reichb.*) is recorded from Orkney (Scapa, Saint Ola, Mainland) by the late Dr. J. T. I. B. Boswell, but not the type of the species (which is cultivated in gardens in Orkney), in Watson, "Top. Bot.," ed. ii, p. 323

(1883). See "Scot. Nat.," No. xlviii, October 1882, p. 374; and Spence, "Flora Orcadensis," p. 58 (1914).

Symphytum peregrinum, Ledeb. (*fide* G. C. Druce).—Grassy ditch sides between two cultivated fields, 50 feet above sea-level, Orgill, Hoy, 16th June 1914, H. H. Johnston. Not native. Introduced by the late Mr. J. G. Moodie Heddle sometime between 1880 and 1890. Common at the corner of one field along a narrow strip fifty yards long, and still growing there on 11th May 1920. This species is recorded from Hoy and Bu, Burray, under the erroneous name of "S. OFFICINALE (Linn.), var. *patens* (Sibth.)," in Spence, "Flora Orcadensis," p. 57 (1914).

UTRICULARIA NEGLECTA, *Lehm.* [=U. MAJOR, *Schmidel*] (*fide* Arthur Bennett).—Mud at bottom of shallow water in a loch, 8 feet above sea-level, Loch of Græmeshall, Holm, Mainland, 25th August 1916, H. H. Johnston. Native. Common among the stems of SCIRPUS TABERNAEMONTANI, *Gmel.*, at the west side of the loch. Luxuriant plants neither in flower nor fruit. A new record for this species for H. C. Watson's county No. 111 Orkney. See "Bot. Exchange Club Secretary's Report for 1916," p. 497 (1917).

SALIX REPENS, *Linn., var. e.* PARVIFOLIA (*Sm.*) ♀ (*fide* E. F. Linton).—Heath, 50 feet above sea-level, Swona, 28th July 1914, H. H. Johnston. Native. Common. Confirms the record of this variety from Orkney ("Westray, 1905"), in Spence, "Flora Orcadensis," p. 67 (1914),

CLASS II.—MONOCOTYLEDONS.

SPARGANIUM AFFINE, *Schnizl., var. b.* MICROCEPHALUM, *Neum.* (*fide* Arthur Bennett).—Mud at bottom of water in a large pool, 80 feet above sea-level, at the junction of Roonie Gill Burn with South Burn, Hoy, 4th September 1914, H. H. Johnston. Native. Common in the pool. Plants in flower and unripe fruit, but mostly the latter. Confirms the record for this variety from Orkney in "The Scottish Botanical Review," vol. i, p. 94 (1912); but my specimens were collected at a different part of Hoy from those collected by the late Rev. E. S. Marshall "in a pool near Sandy Loch, towards Orgill," in July 1900, and

recorded by him as "*S. affine*, Schnizl.," in "Journ. Bot.," vol. xxxix, August 1901, p. 273. See Spence, "Flora Orcadensis," pp. 69 and 70 (1914).

ORCHIS MACULATA, *Linn.*, *subsp.* ERICETORUM, *Linton* in "Flora of Bournemouth," by Rev. E. F. Linton, p. 208 (1902).—Damp pasture, Midland Hill, Orphir, Mainland, 29th July 1876, H. H. Johnston; hillside and hilly pasture, Hoy, 24th and 25th July 1877, respectively, H. H. Johnston; and heath, 220 feet above sea-level, South Dam, Hoy, 22nd June and 3rd September 1914, H. H. Johnston (name confirmed by E. F. Linton). Native and common at all these stations. This subspecies is the commonest and most widely distributed ORCHIS in Orkney, and it is the only form of O. MACULATA, *Linn.*, that I have found in H. C. Watson's county No. 111 Orkney. My specimens, collected in 1876 and 1877, were identified as "O. MACULATA, *Linn.*," by the late Dr. J. T. I. B. Boswell, but he doubtfully referred my specimen collected on 25th July 1877 to this species. In the opinion of Dr. G. Claridge Druce, the *subsp.* ERICETORUM, *Linton*, is the true type of ORCHIS MACULATA, *Linn.*, "Species Plantarum." See "Bot. Exch. Club Secretary's Report for 1914," pp. 99–105 (1915); and *ibid.* for 1917, p. 165 (1918). The following notes were made by me from living plants at South Dam, Hoy, on 22nd June 1914, viz.:—Stem *solid*. Leaves spotted dark purple. Flowers faintly scented. Perianth *pale lilac*, with dark crimson-purple streaks and spots on the two lateral sepals and lip; two lateral sepals *patent*; middle sepal and two petals connivent; lip *flat*, 3-lobed, with the middle lobe *shorter* and *narrower* than the two lateral lobes, and *recurved*. Three of the plants I found in Hoy, on 24th July 1877, had *white* flowers, but *pale lilac* is the usual colour of the flowers in this ORCHIS in Orkney.

JUNCUS BUFONIUS, *Linn.*, *var. b.* FASCICULATUS (*Bert.*) (name confirmed by Arthur Bennett, who remarks, "I think so, but a poor state of it").—Muddy and gravelly foreshore of a brackish water loch, 5 feet above sea-level, Ayre Loch, Copinsay, 22nd August 1916, H. H. Johnston. Native. Common. Plants in unripe fruit. A new record for this variety for H. C. Watson's county No. 111 Orkney.

SCIRPUS TABERNAEMONTANI, *Gmel.* [=S. GLAUCUS, *Sm.*] (name confirmed by Arthur Bennett).—Mud at bottom of shallow water at margin of loch, 8 feet above sea-level, Loch of Græmeshall, Holm, Mainland, 25th August 1916, H. H. Johnston. Native. Common in loch. Plants in flower. Stems 3–5 feet high. Flowers proterogynous, the mature anthers being exserted from the glumes after the stigmas have withered in the *same* flowers. Stigmas 2. Confirms Dr. Gillies's record of this species from Orkney in "Journ. Bot.," No. xiii, January 1864, p. 16, and the late Mr. Magnus Spence's record of it from the Loch of Græmeshall, in his "Flora Orcadensis," p. 81 (1914); and removes "[111; errors?]," from the "supposed errors" in Watson, "Top. Bot.," ed. ii, p. 440 (1883). See "Scot. Nat.," No. ii, new series, October 1883, p. 73.

CAREX PANICULATA, *Linn., form.* SIMPLICIOR, *Anders.* (1846) [=*var. b.* SIMPLEX, *Gray*, "Nat. Arr. Brit. Pl.," p. 46 (1821)] (*fide* Arthur Bennett), growing together with the type of the species C. PANICULATA, *Linn.* (name confirmed by Arthur Bennett), in a marsh, 130 feet above sea-level, Dee of Durkadale, Birsay, Mainland, 25th July 1919, H. H. Johnston. Native. Rare. Stem triangular with *flat* sides in the *form* SIMPLICIOR, *Anders.*, and triangular with one side *flat* and the other two sides *slightly convex* in the type of the species, and in both the form and type the leaves are green and channelled. This form or variety of C. PANICULATA, *Linn.*, is a new record for H. C. Watson's county No. 111 Orkney. Mr. John Spence, Overabist, Birsay, showed me the station at the Dee of Durkadale for these two plants.

CAREX VULGARIS, *Fries, var. c.* MELAENA (*Wimm.*) [=C. GOODENOWII, *Gay, var. c.* MELAENA (*Wimm.*] (*fide* Arthur Bennett, who writes, "Apparently the variety *melaena*").—Wet burnside, 240 feet above sea-level, Sowa Dee, Stromness, Mainland, 15th July 1913, H. H. Johnston. Native. A new record for this variety for H. C. Watson's county No. 111 Orkney.

CAREX RIGIDA, *Good.* (*fide* Arthur Bennett).—Hillside, three-fourths way up in a greenish stripe, north-east side of Ward Hill, Hoy, 18th August 1881, W. A. Irvine Fortescue. Native. Confirms Robert Heddle's record of

this species from the Ward Hill, Hoy, in "Scot. Nat.," No. ii, new series, October 1883, p. 73. See Spence, "Flora Orcadensis," p. 83 (1914).

CAREX OEDERI, *Retz.*, *var. e.* PYGMAEA, *Anders.*, in "Cyperaceae Scand.," p. 25 (1849) (*fide* Arthur Bennett).—Short wet natural pasture, 100 feet above sea-level, between Valley Burn and Glen of Button, Hoy, 19th June and 9th September 1914, H. H. Johnston, Native. Rare. Stigmas 3. A new record for this variety for H. C. Watson's county No. 111 Orkney. In a written note, dated 18th November 1914, Mr. Arthur Bennett writes, "I think I have seen *β pygmaea* from Caithness and Sutherland, whether *inland or not* I cannot say." This variety is not mentioned in "The London Catalogue of British Plants," tenth edition (1908).

CAREX BINERVIS, *Sm. var. b.* ALPINA, *Drejer* in "Crit. Rev. Car." (1841) [=*var. b.* SADLERI (*Linton*) of "Lond. Cat.," ed. x (1908)] (*fide* Arthur Bennett).—Heathery hill-top, 330 feet above sea-level, summit of Kirbuster Hill, Birsay, Mainland, 15th September 1919, H. H. Johnston. Native. Common. A new record for this variety for H. C. Watson's county No. 111 Orkney.

CAREX LIMOSA, *Linn.* (name confirmed by Arthur Bennett, who in a note writes, "All good typical *limosa*").—Swamp, 400 feet above sea-level, Meadow of Surtoo ("Bog of Surtan" in 1-inch Ordnance Map published in 1912), at source of Burn of Kit Huntlins, Birsay, Mainland, 25th July 1919, H. H. Johnston; and swamp, 130 feet above sea-level, Dee of Durkadale, Birsay, Mainland, 15th September 1919, H. H. Johnston. Native and common at both stations. Confirms Mr. G. W. Scarth's record of this species from the Meadow of Surtoo in 1918, in Spence, "Flora Orcadensis," p. 84 (1914). Mr. John Spence, Overabist, Birsay, showed me both stations for this species. This species is not recorded from County No. 111 Orkney in Watson, "Top. Bot.," ed. ii (1883), nor in Bennett, "Suppl. Top. Bot." (1905).

POA PRATENSIS, *Linn.*, *var. b.* SUBCOERULEA (*Smith*) (*fide* Arthur Bennett).—Heap of earth and stones from a stone quarry, 360 feet above sea-level, Hill of Heddle, Firth, Mainland, 15th July 1919, H. H. Johnston. Native.

Common. A new record for this variety for H. C. Watson's county No. 111 Orkney.

FESTUCA OVINA, *Linn.*, *var. b.* tenuifolia (*Sibth.*, as a species, 1794) [=*var. b.* CAPILLATA, *Hackel* (1882)] (*fide* Arthur Bennett).—Marshy burnside, 150 feet above sea-level, Lunan, Harray, Mainland, 1st July 1919. Native. Common. Plants in full flower. A new record for this variety for H. C. Watson's county No. 111 Orkney.

CLASS III.—CRYPTOGAMS.

ASPLENIUM RUTA-MURARIA, *Linn.* (name confirmed by Arthur Bennett).—Clefts of rocks on hillside, 480 feet above sea-level, Rousay, 30th August 1916, H. H. Johnston. Native. Rare. This species is, no doubt, the plant erroneously recorded from Orkney as "ACROSTICHUM *Septentrionale.* Clefts of rocks," in "History of the Orkney Islands," by Rev. Dr. Barry, ed. ii, p. 288 (1808), and which latter species, under the name of "Asplenium septentrionale," is included among the "OMITTED SPECIES" in H. C. Watson's "Florula Orcadensis," published in "Journ. Bot.," No. xiii, January 1864, pp. 11–20. My record of A. RUTA-MURARIA, *Linn.*, from Rousay, confirms the record of this species from Orkney in "Journ. Bot.," No. xiii, January 1864, p. 17. See "Scot. Nat.," No. iii, new series, January 1884, p. 112; and Spence, "Flora Orcadensis," p. 93 (1914).

EQUISETUM PALUSTRE, *Linn.*, *var. c.* NUDUM, *Newman* in "Phytologist," vol. i, p. 627 (1843) [=*var. b.* SUBNUDUM of "Lond. Cat.," ed. vii, (1874)] (*fide* Arthur Bennett and E. S. Marshall).—Marsh at side of mill-pond, 250 feet above sea-level, North Dam, Orgill, Hoy, 27th June 1914. H. H. Johnston. Native. Confirms the late Rev. E. S. Marshall's record of this variety from the same station, in "Journ. Bot." vol. xxxix, August 1901, p. 275. See "Annals Scot. Nat. Hist.," No. 64, October 1907, p. 230; and "Trans. Bot. Soc. Edin.," vol. xxvii, p. 58 (1916).

OBSERVATIONS ON "NOTES ON THE FLORA OF THE ORKNEY ISLES. By Arthur Bennett, A.L.S.," published in "Transactions of the Botanical Society of Edinburgh," vol. xxvii, part i, pp. 54–59 (1916). By Colonel H. H. JOHNSTON, C.B., C.B.E., D.Sc., F.R.S.E., F.L.S.

(Read 10th June 1920.)

Under "*Lupinus nootkatensis*, Donn.," and "*Primula scotica*, Hook.," *for* "Trail" *read* Traill. (The late Dr. William Traill of Woodwick, Orkney.)

Under "*Alchemilla alpestris*, Schmidt," "*Sedum acre*, Linn.," and "*Arctium minus*, Bernh.," the late Mr. A. Somerville should have recorded the name of the station for these plants as Sanday, and not "Sandy Island," which latter is an English translation of the Norse name Sand-ey (now spelled Sanday).

On page 55, line 10 from bottom of page, after "Koch" complete the inverted commas thus:—Koch"; and in line 8 from bottom of same page *delete* the inverted commas *after* "practice."

With reference to "*Hiercium strictum*, Fr.—Hobbister rocks, Orphir, Syme," specimens of a *Hieracium* collected by me and Miss I. B. I. Fortescue, at Hobbister, Orphir, Mainland, on 11th August 1880, were so named by the late Dr. J. T. I. B. Boswell (formerly Mr. John T. Syme), who sent Miss Fortescue's specimens to the Botanical Exchange Club under that name; but my herbarium specimen has since been identified as *Hieracium corymbosum*, Fries, var. *salicifolium* (Lindeb.), by Mr. F. J. Hanbury, and recorded by me under this name in "The Annals of Scottish Natural History," July 1895, p. 178. *H. strictum*, Fries, therefore, does not appear to grow in Orkney. See "Botanical Exchange Club Report for 1880," p. 33 (1881).

Under "*Pimpinella Saxifraga*, Linn.," *delete* "Heathy hillside, 320 feet alt. Hoy, 1912. H. H. Johnston," but *add* the same remarks under "*Pyrola rotundifolia*, Linn."

With reference to "*Euphrasia nemorosa*, Mart.—Moul Head, Deerness, 1884. W. I. Fortescue sp.," specimens of this gathering were sent to the Botanical Exchange Club

in 1885, and in the "Botanical Exchange Club Report for 1885," p. 133 (1886), the late Mr. F. Townsend remarks, "Stunted form of *E. nemorosa*." This name is probably an error of identification, because, with reference to other specimens of *Euphrasia* collected by me at Skaill, Sandwick, Mainland, on 19th August 1881, and by me and Mr. W. I. Fortescue at Linksness, Hoy, on 20th August 1885, on all of which the late Mr. F. Townsend remarked, "Robust coast form of *E. nemerosa*, H. Mart.; flowers unusually large," the late Rev. E. S. Marshall wrote as follows, on 16th October 1913:—"These are all, I believe, *E. borealis*, Townsend, certainly not *E. nemerosa*. At that time I do not think that Mr. Townsend had yet described *borealis*." I have asked Dr. W. A. Irvine Fortescue to send me specimens of his Moul Head *Euphrasia*, and, if received, I shall send them to Mr. Cedric Bucknall for identification.

Rumex conspersus, Hartm., is recorded for county No. 111 Orkney, on Dr. J. T. I. B. Boswell's authority, in H. C. Watson's "Topographical Botany," ed. ii, p. 358 (1883); but in Dr. Boswell's manuscript catalogue of plants seen by him in Orkney (copied by me on 11th January 1881), he has entered a "?" after both the name of this species and after the name of the station for it at "Scapa," together with the following note:—"B. saw a plant at Scapa excessively like this, but can't be quite sure." ("B." stands for Boswell.) Dr. Boswell paid his last visit to Orkney in 1880, so that his record for this species in Orkney is still doubtful, and requires confirmation.

On page 57, line 1 at top of page, *for* "var. *granulatus*" *read* var. *trigranulatus*.

With reference to "*Betula glutinosa*, Fr.—Orkney. Syme in Top. Bot., 372," there is only one kind of native Birch in Orkney, and the following synonyms all refer to the same plant, viz.:—*Betula alba*, Linn., var. b. *glutinosa*, of "The London Catalogue of British Plants," ed. vii (1874); *B. glutinosa*, Fr., ibid., ed. viii (1886); *B. pubescens*, Ehrh., ibid., ed. ix (1895); *B. tomentosa*, Reith. et Abel, ibid., ed. x (1908); and *B. alba*, Linn., of Babington's "Manual of British Botany," ed. ix, p. 388 (1904), under which last name the Orkney Birch is recorded in Magnus Spence's "Flora Orcadensis," p. 65 (1914).

Under "*Ceratophyllum demersum*," *for* "Loch of Ayre, Kirbister," *read* Loch of Ayre, Holm. See "The Scottish Naturalist," No. 1, New Series, July 1883, p. 22, where Mr. W. Irvine Fortescue has recorded the late Mr. Robert Heddle's two stations for this species as "Loch of Ayre, Hubbin at Kirbuster." The former station is in the parish of Holm, and the latter one in the parish of Orphir, both in Mainland and seven miles apart.

With reference to "*Zannichellia palustris*, Linn.—Kirbister Loch, 1850, Syme," this species is recorded from that station by Mr. John T. Syme (afterwards Dr. J. T. I. B. Boswell) in "Trans. Bot. Soc. Edin.," vol. iv, part i, p. 48 (1850); but, on 31st December 1878, the late Dr. Boswell informed me that the above-mentioned name was an error, and that the correct name of the plant he found in the Loch of Kirbister is *Z. polycarpa*, Nolte, var. b. *tenuissima*, Fries. *Z. palustris*, Linn., has never been seen in Orkney by Dr. Boswell, and "111 Orkney, Syme sp.," under this species, should, therefore, be omitted from H. C. Watson's "Topographical Botany," ed. ii, p. 424 (1883). The "Syme sp." probably refers to the specimens collected by Mr. Syme in 1849, and at that time erroneously labelled by him as "*Zannichellia palustris*, Linn.," as already explained above.

Luzula pilosa, Willd, has never been seen in Orkney by Dr. Boswell, Dr. Fortescue, Mr. Magnus Spence, nor by me, although I have specially looked for it during the present year in Mainland and Hoy, where *L. sylvatica*, Gaud., is common in many different localities. Mr. Patrick Neill, in his "Tour through Orkney and Shetland," in 1804, p. 186 (1806), records this species under the name of "*Juncus pilosus*, Hairy Rush," from Rousay.

Under "*Festuca bromoides*, Linn.," *for* "Skail" *read* Skaill.

Equisetum palustre, Linn., var. *nudum*, Newm., was recorded from Orgill, Hoy, by the late Rev. E. S. Marshall, in "Journ. Bot.," vol. xxxix, August 1901, p. 275.

Under "*Ophioglossum vulgatum*, Linn., var. *ambiguum*, Coss. et. Germ.," *for* "Miss P. Deuche" *read* Miss P. Deuchar.

Delete the "*" before "*Chara fragilis*, Desv. var. *capil-*

lacea, Coss. et Germ." This variety is recorded in Spence's "Flora Orcadensis," p. 136 (1914).

On page 59, line 13 from top of page, *for* "Rev. J. Hendrick" *read* Rev. J. Headrick.

CORRECTIONS TO "NOTICE OF SOME OF THE RARER PLANTS OBSERVED IN ORKNEY DURING THE SUMMER OF 1849. By John T. Syme, Esq.," published in "Transactions of the Botanical Society of Edinburgh," vol. iv, part i, pp. 47–50 (1850). By Colonel H. H. JOHNSTON, C.B., C.B.E., D.Sc., F.R.S.E., F.L.S.

(Read 10th June 1920.)

On 31st December 1878, the late Dr. J. T. I. B. Boswell (formerly Mr. John T. Syme) made the following corrections in my copy of the above-mentioned "Transactions," viz.:—

Page 48, line 10 from bottom of page, for "*Potamogeton filiformis*" read *Potamogeton pectinatus*, Linn.

Page 48, line 5 from bottom of page, for "*Zannichellia palustris*" read *Zannichellia polycarpa*, Nolte, var. b. *tenuissima*, Fries.

Page 49, line 2 from top of page, for "*Eleocharis uniglumis*" read *Eleocharis multicaulis*, Sm.

The following corrections should also be made. viz.:—

Pages 47, 48, and 50, *for* "mainland" *read* Mainland.

Pages 48–50, *for* "Robert Heddel" *read* Robert Heddle.

Pages 48 and 50, *for* "Howton Head" *read* Houton Head.

Page 48, line 11 from bottom of page, *for* "north-west" *read* north-east.

Pages 48 and 49, *for* "Neversdale" *read* Naversdale.

Page 49, *for* "Bow" *read* Bu.

Page 49, line 7 from bottom of page, *for* "north-west" *read* north-east.

Page 50, line 11 from top of page, *for* "north-west" *read* north-east.

A New Species of Phomopsis Parasitic on the Douglas Fir. By Malcolm Wilson, D.Sc., F.R.S.E., F.L.S.

(Read 10th June and 21st October 1920.)

Phomopsis Pseudotsugae, n. sp.

Pycnidia undique densiuscule distributa vulgo 2–3 mm. inter se distantia, obpyriformia, basi complanata, e cortice rupta paullo protrusa, opaco-nigrida, ·3–1 mm. diametro, ostiolo pertusa, intus plurilocellaria disseptis centralibus tenuibus atque cum muris obscure nigro-olivaceis; sporulae hyalinae, dimorphae; aliae (A-sporulae) elliptico-fusoideae, eguttulatae, utrinque obtusae $5{\cdot}5–8{\cdot}5 \times 2{\cdot}5–4\,\mu$, sporophoris subulatis circiter $13\,\mu$ longis; aliae (B-sporulae) in pycnidiis discretis orientes, bacillares, curvatae vel raro rectae, eguttulatae, utrinque obtusae, $5–6 \times 1{\cdot}5\,\mu$, sporophoris rectis, subulatis, $13 \times 1–2\,\mu$.

Hab. in ramis foliisque vivis *Pseudotsugae Douglasii* quam in Scotia multo vexat.

The fungus attacks the Douglas fir[1] in two distinct ways. In the first the leading shoot is killed back for a variable distance, usually about 9 inches. In the second the young tree is attacked a short distance above the ground level; the outer tissues are killed either on one side only or completely round the stem, and ultimately the whole tree is killed. In both cases a very characteristic feature of the disease is the sudden decrease in diameter in passing from the healthy to the diseased portion of the stem. The fungus has been found up to the present only on trees up to twelve years old.

The pycnidia are at first covered by the bark or epidermis of the leaf, and later on break through, in the case of those on the stems, by means of an elongated slit. Those containing A-spores are generally rather larger, are often found in groups of two, and occur on the older parts of the host, never on the leaves; only A-spores have been found on plants attacked near ground level. Pycnidia containing B-spores are usually rather smaller, more

[1] An account of the effect of the fungus on its host appears in the current number of the Transactions of the Royal Scottish Arboricultural Society.

decidedly conical, solitary, and have been found on both surfaces of the leaf, but usually on the upper surface and on the younger parts of the one-year-old stems.

The external wall of the pycnidium is everywhere several cells in thickness; these cells are more or less hyaline, and are tinged with green below, but are more opaque and darker in colour towards the upper part of the pycnidium where the wall is considerably thicker. The ostiolar passage is comparatively wide, and although the spores often emerge in the form of tendril-like masses, they frequently form rounded drops at the mouth of the pycnidium.

The A-spores vary considerably in shape and size. When a mature pycnidium (*i.e.* one from which the spores will exude naturally if kept sufficiently damp) is crushed most of the spores are found detached from the sporophores, and the latter form a distinct zone in contact with the wall of the pycnidium. Many of the sporophores appear to be partly disintegrated. The spores can be roughly divided into three groups, as follows:—(1) A few of small size ($5{\cdot}5 \times 2{\cdot}5\ \mu$), which stain readily, and are still attached to the sporophores; (2) a large number, free from the sporophores, which have attained their full length ($6{\cdot}5$–$8\ \mu$), but which are comparatively narrow ($2{\cdot}5\ \mu$ wide), and which still stain readily; (3) a considerable number, free from the sporophores, which are mature and have attained their full size ($6{\cdot}5$–$8{\cdot}5 \times 3$–$4\ \mu$), in which the wall is slightly thicker, and which do not stain readily. Spores which naturally exude from the pycnidium are similar to those of the third group; they are not accompanied by the sporophores, for these remain inside the pycnidium attached to its walls. The spores are without oil-drops, but often have a minute granule towards one or both ends.

The B-spores are unusually short compared to those of other species of *Phomopsis*,[1] but show the characteristic arrangement parallel to each other "in serried ranks" when they emerge from a crushed pycnidium. They are easily detached from the sporophores, which, as in the case of the A-spores, remain attached to the walls of the pycnidium.

[1] See Grove, The British Species of *Phomopsis*, Kew Bull., 1917, p. 49.

In both kinds of spores the sporophores can be clearly seen in the young pycnidium, but at maturity they become somewhat mucilaginous, and partially disintegrate.

Phomopsis Pseudotsugae differs from *Phoma abietina* Hartig, which has been stated by Böhm[1] to attack the Douglas fir, not only in the occurrence of the B-spores but also in the form and size of the A-spores. Examination of a specimen of *P. abietina* on *Abies pectinata* collected by Hartig shows that the spores of the species are nearly twice the size of those of *Phomopsis Pseudotsugae*; they are acute at the ends, rather irregular in form, and provided with two or more large oil-drops towards the ends, so that the protoplasm is almost confined to the central portion of the spore. *P. abietina* Hartig is synonymous with *Fusicoccum abietinum* Prill. et Delacr., and should now be placed in the genus *Phomopsis*. *Phoma pithya* Sacc. (*Sclerophoma pithya* Died.) has also been stated by Rostrup[2] to attack the Douglas fir, and this species is considered by Lind[3] to be the same as *Phoma abietina* Hartig. *Phomopsis Pseudotsugae* differs from *Phoma pithya* both in the structure of the pycnidium and in the absence of sporophores in the latter, which, as far as known at present, is only saprophytic.[4]

Specimens of *Phomopsis Pseudotsugae* have been obtained from various localities in Perthshire, from near Forres, and from Argyllshire, Dumfries, and Inverness, and the species appears to be widely distributed in Scotland.

[1] Zeitsch. f. Forst- u. Jagd-wesen, 1896, p. 154.

[2] Undersogelser over Snyltes vampes Angreb paa Skovtraer, 1883–1888.

[3] Danish Fungi, Copenhagen, 1913, p. 421.

[4] See Grove, New or Noteworthy Fungi, Pt. VI, Journ. Bot., vol. lvi, 1918, p. 293.

TRANSACTIONS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXV

ADDITIONS TO THE FLORA OF ORKNEY, AS RECORDED IN WATSON'S "TOPOGRAPHICAL BOTANY," Second Edition (1883). By Colonel H. H. JOHNSTON, C.B., C.B.E., D.Sc., F.R.S.E., F.L.S.

(Read 17th March 1921.)

This paper forms a continuation of three papers on the same subject, one of which I read before the Scottish Natural History Society on 4th April 1895, and which was published in "The Annals of Scottish Natural History," July 1895, and the other two before the Botanical Society of Edinburgh on 15th January 1914 and 10th June 1920, and which were published in the Society's "Transactions," vol. xxvi, pp. 207–217 (1914), and vol. xxviii, pp. 23–42 (1920), respectively. Most of the plants mentioned in this paper were collected by me during the year 1920.

Before and after the publication of the second edition of Watson's "Topographical Botany," in 1883, several of the plants mentioned in the following list have been recorded from Orkney by me and other botanists; but, as the value of botanical records is greatly enhanced by the possession of authentic specimens, I have included in this list the names of all specimens in my herbarium, which are either additional to or confirm doubtful records of the plants recorded from County No. 111 Orkney in the second edition of the above-mentioned book.

In the case of those plants which have already been recorded from Orkney, references are given in the following list, under each species and variety, to the books in which the records have been published. These records are principally contained in "A Tour through some of the Islands of Orkney and Shetland," in the year 1804, by Patrick Neill (1806); "Notice of some of the rarer Plants observed in Orkney during the Summer of 1849," by John T. Syme, Esq., published in the "Transactions of the Botanical Society of Edinburgh," vol. iv, pp. 47–50 (1850); "Florula Orcadensis—A list of plants reported to occur in the Orkney Isles," by H. C. Watson, Esq., F.L.S., published in the "Journal of Botany," No. xiii, pp. 11–20 (January 1864); Annual Reports of the Botanical Exchange Club of the British Isles; "A new List of the Flowering Plants and Ferns of Orkney," edited by W. A. Irvine Fortescue, and published in "The Scottish Naturalist" (1882–1884); "Supplement to Topographical Botany, ed. ii," by Arthur Bennett, A.L.S. (1905); and "Flora Orcadensis," by Magnus Spence, F.E.I.S. (1914).

The nomenclature followed is that of the second edition of Watson's "Topographical Botany" (1883), except in the case of species and varieties which are not recorded in that work. In the latter case the nomenclature adopted is that of "The London Catalogue of British Plants," tenth edition (1908). Non-native plants, which have become naturalised in Orkney, are distinguished by a * prefixed to the names, and the names of casuals are printed in italics.

Of the 49 species, varieties, and hybrids recorded from Orkney in the following list, 29 are native, 1 is naturalised, 18 are mere casuals introduced into Orkney through the agency of cultivation, and 1 was planted by man.

ABBREVIATIONS.

"Annals Scot. Nat. Hist." = The Annals of Scottish Natural History.

Bennett, "Suppl. Top. Bot." = Supplement to H. C. Watson's Topographical Botany, second edition. By Arthur Bennett, A.L.S. (1905).

"Bot. Exch. Club Report" (separate Reports by the Secretary and Distributor) = Report of The Botanical Exchange Club of the British Isles, at present called The Botanical Exchange Club and Society of the British Isles.

"Journ. Bot." = The Journal of Botany.
"Lond. Cat." = The London Catalogue of British Plants.
Neill, "Tour" = A Tour through some of the Islands of Orkney and Shetland, in the year 1804. By Patrick Neill, A.M., Secretary to the Natural History Society of Edinburgh (1806).
"Scot. Nat." = The Scottish Naturalist.
Spence, "Flora Orcadensis" = Flora Orcadensis. By Magnus Spence, F.E.I.S. (1914).
Watson, "Top. Bot." = Topographical Botany, second edition. By H. C. Watson (1883).

Corrections.

In "Annals Scot. Nat. Hist," July 1895, p. 177, *for* "Foeniculum vulgare, *Gaert.*," *read* *Carum Carvi, *Linn.*, and in the next line *for* "Native" *read* Naturalised.

In "Bot. Exch. Club Report for 1912," p. 273 (1913); "Trans. Bot. Soc. Edin.," vol. xxvi, p. 215 (1914); and Spence, "Flora Orcadensis," p. 134 (1914), *for* "Euphrasia curta, *Wettst.*, *var. b.* glabrescens, *Wettst.* (*fide* E. S. Marshall)," *read* Euphrasia caerulea, *Tausch* (*fide* Cedric Bucknall).

In "Trans. Bot. Soc. Edin.," vol. xxvi, p. 216 (1914), and Spence, "Flora Orcadensis," p. 136 (1914), *for* "Avena pratensis, *Linn.* (*fide* Arthur Bennett)," *read* Arrhenatherum elatius, *Mert. et Koch* [= Avena elatior, *Linn.*] (*fide* G. C. Druce and Arthur Bennett).

Class I.—Dicotyledons.

Aconitum Stroerckianum, Reichenb. (*fide* Otto Stapf).—Rubbish heap at seashore, 10 feet above sea-level, Hamla Voe, Stromness, Mainland, 16th July 1920, Henry Halcro Johnston. Not native. Four plants only seen by me, and these are now extinct, through the bank on which they grew having been washed away by the sea during a severe storm, accompanied by an exceptionally high tide, on 15th November 1920. Sepals pale whitish-blue, with dark purplish-blue margins. This species is cultivated in gardens in Stromness, from which it has probably been thrown out with weeds and rubbish.

Lepidium perfoliatum, Linn. (*fide* G. C. Druce).—Gravelly ground round filter beds, 200 feet above sea-level, Kirkwall Waterworks Reservoir, near Hatston,

Saint Ola, Mainland, 9th August 1920, H. H. Johnston. Not native. Very rare.

Barbarea intermedia, Boreau (*fide* T. A. Sprague).—Garden hedge, 15 feet above sea-level, Manse, Hoy, 11th June 1920, 31st July 1920, and 30th September 1920, H. H. Johnston. Not native. A garden weed. Very rare.

NASTURTIUM TERRESTRE, *Sm.* [=N. PALUSTRE, *DC.*].—Marshy lochside, 10 feet above sea-level, Loch of Garsow, North Ronaldsay, 21st August 1920, H. H. Johnston; and marshy lochside, 10 feet above sea-level, Loch of Hooking, North Ronaldsay, 23rd August 1920, H. H. Johnston. Native and rare at both stations. Plants in full flower. Petals yellow. Confirms the record of this species from North Ronaldsay in "Annals Scot. Nat. Hist.," No. 69, p. 53 (January 1909), and in Spence, "Flora Orcadensis," p. 5 (1914), where it is recorded from Ancum Loch; but I failed to find it at that loch on 20th and 23rd August 1920, and Mr. John Scott, Northmanse, North Ronaldsay, informed me, on 20th August 1920, that it does not grow there.

Sinapis muralis, Br. [=*Diplotaxis muralis*, DC.] (*fide* G. C. Druce).—Flower border at the side of a house, 40 feet above sea-level, Finstown, Firth, Mainland, 9th August 1920 and 23rd September 1920, H. H. Johnston. Not native. A garden weed. Very rare.

Viola cornuta, Linn. (*fide* G. C. Druce).—Waste ground, 80 feet above sea-level, Finstown, Firth, Mainland, 29th July 1920, H. H. Johnston. Not native. Petals blue, with a pale yellowish-white spot on throat of lowest petal.

SAGINA PROCUMBENS, *Linn.*, *var. b.* SPINOSA, *Gibs.* (name confirmed by Arthur Bennett).—Road, 150 feet above sea-level, Grieveship, Stromness, Mainland, 17th August 1920, H. H. Johnston. Native. Rare. Plants in fruit. Leaves linear, awned, minutely spinose—ciliate on the margins. Peduncles and sepals glabrous. Confirms Dr. J. Grant's record for this variety from "near Stromness" in Spence, "Flora Orcadensis," p. 12 (1914).

HYPERICUM PULCHRUM, *Linn.*, *var. b.* PROCUMBENS, *Rostrup* (*fide* Arthur Bennett).—Natural heathery and grassy pasture, 40 feet above sea-level, Purtabreck, North Ronaldsay, 20th August 1920, H. H. Johnston. Native.

Rare. See Spence, "Flora Orcadensis," p. xix (1914), with reference to an exposed heath near the Lighthouse at the north end of North Ronaldsay, where he states:—"St. John's wort, *Hypericum pulchrum*, was so prostrated by exposure to high winds that at first it looked like a new variety."

Geranium pratense, Linn. (*fide* Arthur Bennett).—Roadside, 50 feet above sea-level, near Holland House, North Ronaldsay, 24th August 1920. Not native. Very rare. Confirms the record of this species as an alien in Orkney, by the late Professor J. W. H. Trail, in "Annals Scot. Nat. Hist.," No. 56, p. 232 (October 1905). See Bennett, "Suppl. Top. Bot.," ed. ii, p. 25 (1905); and Spence, "Flora Orcadensis," p. 15 (1914).

Medicago falcata, Linn. (*fide* G. C. Druce).—Gravelly ground round filter beds, 200 feet above sea-level, Kirkwall Waterworks Reservoir, near Hatston, Saint Ola, Mainland, 9th August 1920, H. H. Johnston. Not native. Rare.

Vicia hirsuta, S. F. Gray.—Garden, 50 feet above sea-level, Scapa Distillery, Saint Ola, Mainland, 16th September 1920, H. H. Johnston. Not native. A weed of cultivation. One plant only seen by me. Removes 111 Orkney from the "supposed errors []" in Watson, "Top. Bot.," ed. ii, p. 123 (1883). Confirms the record of this species as an alien in Orkney in Barry's "History of the Orkney Islands," second edition, p. 285 (1808), under the name of "ERVUM *Hirsutum*." See "Journ. Bot.," No. xiii, p. 14 (January 1864); "Scot. Nat.," No. xlvii, p. 326 (July 1882); Watson, "Top. Bot.," ed. ii, p. 123 (1883), in which the supposed error "[]" should be deleted; "Annals Scot. Nat. Hist.," No. 26, p. 107 (April 1898), in which "111 (?)" should be deleted; and Spence, "Flora Orcadensis," p. 18 (1914).

ALCHEMILLA VULGARIS, *Linn., var. b.* ALPESTRIS, *Pohl* (*fide* Arthur Bennett).—Burnside, Naversdale, Orphir, Mainland, 16th July 1877 and 31st July 1879, H. H. Johnston; and natural pasture near a loch, 55 feet above sea-level, Hobbister, Loch of Kirbister, Orphir, Mainland, 3rd August 1920, H. H. Johnston. Native and rare at both these stations. Confirms the late Rev. E. S. Marshall's record of this variety from Orkney ("near Stromness") in "Journ. Bot.," vol. xxxix, p. 268 (August 1901); and the

late Mr. A. Somerville's record for it from Sanday, 1898, in "Trans. Bot. Soc. Edin.," vol. xxvii, p. 55 (1916).

ROSA MOLLISSIMA, *Willd., var. d.* PSEUDO-RUBIGINOSA (*Lej.*). [=R. MOLLISSIMA, *Willd., var. c.* SUBERECTA of "Lond. Cat.," ed. vii (1874); R. MOLLIS, *Sm., var. d.* PSEUDO-RUBIGINOSA (*Lej.*) of "Lond. Cat.," ed. x (1908), where this variety is erroneously placed under ROSA OMISSA, *Déségl.*; and R. ARDUENNENSIS, *Crép.*] (*fide* William Barclay).—Grassy banks at burnside, 20 feet above sea-level, Wideford Burn, Saint Ola, Mainland, 23rd July 1920 and 16th September 1920, H. H. Johnston. Native. Petals white. Ripe fruit scarlet, with persistent sepals.

ROSA CANINA, *Linn., var.* FUGAX (*Gren.*) [=R. GLAUCA, *Vill., var. h.* FUGAX (*Gren.*) of "Lond. Cat.," ed. x (1908)] (*fide* William Barclay).—Heathery banks at burnside, 90 feet above sea-level, South Burn, Hoy, 1st October 1920, H. H. Johnston. Very rare. Leaves glabrous beneath. Ripe fruit dull yellowish-red, with persistent sepals. With reference to my specimens of this species, Mr. William Barclay, in a note, dated 8th November 1920, writes as follows:—"The fruits on the later collected specimen have developed and ripened fairly well. The tendency of the prickles to grow in little groups is noteworthy." My specimens in ripe and unripe fruit were collected from the same plant on the same date.

[*Fuchsia Riccartoni*, Hort. Am bor. Cult. (*fide* G. C. Druce).—Rocky burnside, 300 feet above sea-level, Syradale, Firth, Mainland, 23rd September 1920, H. H. Johnston. Not native. Planted. Two plants only seen by me, one below the waterfall in the Burn of Eskadale, on the north side of Syradale, from which my specimen was taken, and the other one on a grassy bank, 350 feet above sea-level, at Syradale Burn. The latter shrub was planted by Mr. William Towers in March 1914, but he does not know the name of the person who planted the other shrub below the waterfall, which has been there for a considerable time prior to 1914.]

Ribes nigrum, Linn.—Grassy banks at burnside, 20 feet above sea-level, near the Mill of Firth, Mainland, 20th May 1920, H. H. Johnston. Not native. One plant, in full flower, only seen by me.

Myrrhis Odorata, Scop.—Artificial pasture at roadside, 70 feet above sea-level, Finstown, Firth, Mainland, 22nd May 1920, H. H. Johnston. Not native. An escape from a garden. Rare.

LEONTODON AUTUMNALIS, *Linn., var. d.* SIMPLEX, *Duby* (*fide* Arthur Bennett).—Damp natural pasture, 30 feet above sea-level, Deepdale, Stromness, Mainland, 14th August 1920, H. H. Johnston. Native. Common. Plants in full flower. Leaves with a few hairs on both surfaces. Phyllaries clothed with greenish-black hairs. Style and its two branches yellowish-brown; and short, natural pasture, 15 feet above sea-level, west of the United Free Church, North Ronaldsay, 21st August 1920. Native. Common. Plants in full flower. Leaves thinly hairy on both surfaces. Scapes 1–2, decumbent, 1-headed. Phyllaries clothed with greenish-black hairs. Corolla yellow, or yellow above and striped dull crimson beneath. Style and its two branches yellowish-brown. Confirms the record of this variety from Orkney ("Ward Hill, Orphir") in Spence, "Flora Orcadensis," p. 43 (1914).

TARAXACUM SPECTABILE, *Dahlst, var.* MACULIGERUM, *Dahlst.* (*fide* G. C. Druce). Grassy banks at seashore, 10 feet above sea-level, Hamla Voe, Stromness, Mainland, 19th May 1920, H. H. Johnston. Native. Very common. Plants in full flower. Leaves dull green above, paler green beneath. Outer phyllaries recurved both in flower-bud and in the fully-expanded flowers; inner phyllaries not appendaged at the apex. Fruit brown.

Chrysanthemum Parthenium, Pers. (*fide* J. Hutchinson).—Side of a footpath outside a garden, 90 feet above sea-level, Daisybank, Kirkwall, Saint Ola, Mainland, 23rd July 1920, H. H. Johnston. Not native. An escape from Daisybank garden. Very rare. Corolla of ray-florets white.

Anaphalis margaritacea, Benth. et Hook. fil. [= *Gnaphalium margaritaceum*, Linn.] (*fide* G. C. Druce).—Banks at burnside, 140 feet above sea-level, Burn of Beaquoy, near The Wilderness, Birsay, Mainland, 9th August 1920, H. H. Johnston; and grassy banks at burnside, 200 feet above sea-level, Burn of Vinden, Firth, Mainland, 23rd September 1920, H. H. Johnston. Not native. Very rare at both stations.

*Mimulus Langsdorfii, *Donn* [=*M. luteus, *Linn.*].—Wet burnside, 120 feet above sea-level, Caldale, Saint Ola, Mainland, 22nd July 1920, H. H. Johnston; and wet burnside, 10 feet above sea-level, Swanbister Burn, Orphir, Mainland, 3rd August 1920, H. H. Johnston. Naturalised at both stations. Very rare at Caldale, but common at Swanbister Burn. Corolla yellow.

Veronica Tournefortii, C. Gmel. [=*V. Buxbaumii*, Ten.].—Garden, 60 feet above sea-level, Schoolhouse, Kirbister, Orphir, Mainland, 3rd August 1920, H. H. Johnston. Not native. A weed of cultivation. Rare. Confirms the record of this species as an alien from Orkney in "Annals Scot. Nat. Hist.," No. 30, p. 96 (April 1899). See Bennett, "Suppl. Top. Bot.," ed. ii, p. 60 (1905); and Spence, "Flora Orcadensis," p. 52 (1914).

EUPHRASIA KERNERI, *Wettst.* (*fide* Cedric Bucknall).—Shell-sandy natural pasture near seashore, 10 feet above sea-level, Backaskaill Bay, Cross, Sanday, 29th August 1920, H. H. Johnston. Native. Very common. Plants in full flower. Leaves 2–6 toothed. Corolla pale whitish lilac-purple, with dark purple lines, and a yellow spot on throat of lower lip. A new record for H. C. Watson's county No. 111 Orkney.

EUPHRASIA CAERULEA, *Tausch* (*fide* Cedric Bucknall).—Wet natural pasture on hillside, 300 feet above sea-level, Wart Hill, Hoy, 15th August 1912, 1st September 1919, and 31st July 1920, H. H. Johnston. Native. Common. Plants growing among EUPHRASIA SCOTTICA, *Wettst.*, which has a smaller corolla than that of E. CAERULEA, *Tausch.* Leaves 2–10 toothed. Corolla lilac, with dark purple lines, and a yellow spot on throat of lower lip. A new record for H. C. Watson's county No. 111 Orkney, and also new to the British flora. The specimens collected by me on 15th August 1912 were erroneously recorded as "EUPHRASIA CURTA, *Wettst., var. b.* GLABRESCENS, *Wettst.*" (*fide* E. S. Marshall), in "Bot. Exch. Club Report for 1912," p. 273 (1913); "Trans. Bot. Soc. Edin.," vol. xxvi, p. 215 (1914); and Spence, "Flora Orcadensis," p. 134 (1914). See "CORRECTIONS."

Rhinanthus major, Ehrh. (name confirmed by Arthur Bennett).—Shell-sandy vetch and oat field, 15 feet above

sea-level, Galilee, North Loch, Lady, Sanday, 27th August 1920, H. H. Johnston. Not native. A weed of cultivation. Rare. Calyx pale yellow. Central lobe of upper lip of corolla dark purple; two lateral lobes oblong, longer than broad, yellow. Confirms the record of this species from Orkney in "Annals Scot. Nat. Hist.," No. 30, p. 97 (April 1899); Bennett, "Suppl. Top. Bot.," ed. ii, p. 60 (1905), where, Mr. Arthur Bennett, in a post-card dated 18th February 1921, informs me, the reference "Sc. Nat. 1883, 73" is wrong, and it should *read* "Annals Scot. Nat. Hist.," No. 30, p. 97 (April 1899); and Spence, "Flora Orcadensis," p. 53 (1914).

AJUGA REPTANS, *Linn.* × PYRAMIDALIS, *Linn.* (*fide* G. C. Druce and Arthur Bennett).—Dry heathery and grassy hillside (burnt within the past few years) facing the south, 290 feet above sea-level, north side of Syradale, Firth, Mainland, 20th May 1920, H. H. Johnston. Native. Rare. Plants in full flower growing among typical AJUGA PYRAMIDALIS, *Linn.*, and in the same valley with AJUGA REPTANS, *Linn.*, which I collected near the same place on 17th August 1883, and quarter of a mile distant on 6th September 1919. This hybrid resembles A. REPTANS, *Linn.*, in having stolons which are shorter than those of that species, the leaves are subglabrous or have a few short hairs on both surfaces and longer hairs on the margins, the whorls of flowers are arranged in laxer pyramidal spikes than those of A. PYRAMIDALIS, *Linn.*, and the corolla is blue, with the middle lobe of the lower lip slightly emarginate. In my specimens of A. PYRAMIDALIS, *Linn.*, collected at the same station, on 20th May 1920 and 29th July 1920, the leaves and bracts are very hairy on both surfaces in most of the plants, but in other plants they are only moderately hairy on both surfaces. Mr. Arthur Bennett informs me that the above-mentioned hybrid is recorded in Foche, "Pflanzen Mischlinge," p. 341 (1881), and in other European botanical works.

SCUTELLARIA GALERICULATA, *Linn.*—Artificial heap of stones at seashore, 10 feet above sea-level, Sennes, Garsow Wick, North Ronaldsay, 21st August 1920, H. H. Johnston. Native. Rare. Plants in full flower. Corolla blue. On

20th August 1920, Mr. John Scott, Northmanse, North Ronaldsay, informed me that he first saw the Skull-cap growing on the seashore, at Garsow Wick, outside the stone wall that surrounds the island of North Ronaldsay, about the year 1880; but that since then it has disappeared from the seashore outside the wall, and now grows inside the wall among a long artificial heap of stones. Confirms the records of this species from Orkney in "Annals Scot. Nat. Hist.," No. 68, p. 251 (October 1908); and Spence, "Flora Orcadensis," p. 55 (1914).

PLANTAGO LANCEOLATA, *Linn.*, *var.* DECUMBENS, *Lange* (*fide* G. C. Druce).—Shell-sandy links at seashore, 10 feet above sea-level, Links of Skaill, Sandwick, Mainland, 4th August 1920, H. H. Johnston. Native. Common. Dr. G. C. Druce informs me that this is the same plant as that erroneously recorded as "Plantago media" in Edmondston's "Flora of Shetland," p. 17 (1845).

Chenopodium hybridum, Linn. (*fide* G. C. Druce).—Gravelly ground round filter beds, 200 feet above sea-level, Kirkwall Waterworks Reservoir, near Hatston, Saint Ola, Mainland, 9th August 1920, H. H. Johnston. Not native. Very rare. Plants neither in flower nor fruit.

ATRIPLEX LACINIATA, *Linn.* [=A. ARENARIA, *Woods.*] (*fide* Arthur Bennett).—Shell-sandy seashore, 5 feet above sea-level, Backaskaill Bay, Cross, Sanday, 25th August 1920. H. H. Johnston. Native. Common. Plants in full flower. Leaves green above, whitish-green beneath, mealy white on both surfaces, especially the lower. Flowers with an offensive odour. Perianth segments 5. Stamens 5. Confirms the record of this species for H. C. Watson's county No. 111 Orkney in Neill, "Tour," p. 188 (1806), where it is recorded as growing on "seashores, rarely." See "Journ. Bot.," No. xiii, p. 20 (January 1864), where Mr. H. C. Watson has placed this species in his "LIST OF OMITTED SPECIES"; "Annals Scot. Nat. Hist.," No. 30, p. 101, where the record for Orkney is shown as "111 (?)"; and Spence, "Flora Orcadensis," p. 61 (1914).

Atriplex patula, Linn., var. d. *bracteata*, Westerlund (*fide* G. C. Druce).—Gravelly ground round filter beds,

200 feet above sea-level, Kirkwall Waterworks Reservoir, near Hatston, Saint Ola, Mainland, 9th August 1920 and 9th October 1920, H. H. Johnston. Not native. Very rare.

SALIX AURITA, *Linn.* × CINEREA, *Linn.* ♀ (*fide* G. C. Druce and Arthur Bennett).—Heathery banks at burnside, 90 feet above sea-level, South Burn, Hoy, 30th August 1919 (plants in leaf only), 7th May 1920 (plants in full flower), and 12th June 1920 (plants in leaf and unripe fruit), H. H. Johnston. Native. Rare. An erect, much-branched shrub, 3 feet high, with the lower part of the stems submerged in running water in a burn. Both parents grow along the banks of the South Burn in the same neighbourhood. All my three gatherings of specimens were collected from the same individual plant.

SALIX REPENS, *Linn., form.* ARGENTEA (*Sm.*) ♂ [= *var. g.* ARGENTEA (*Sm.*) of "Lond. Cat.," ed. vii (1874)] (*fide* Arthur Bennett).—Heathery crags on hillside, 520 feet above sea-level, north-east side of Cuilags, Hoy, 1st September 1919 (plants in leaf only) and 11th June 1920 (plants in leaf and flower, with the stamens mostly withered), H. H. Johnston. Native. Rare. Both my gatherings of specimens were collected from the same individual plant. Confirms the record of this form or variety from Orkney ("Sanday") in Neill, "Tour," p. 189 (1806). See "Scot. Nat.," No. i, new series, p. 23 (July 1883).

MYRICA GALE, *Linn.*—Ditch, near the old Established Church, Eday, 13th June 1920, Miss Ann J. H. Marwick. Confirms the record of this species for H. C. Watson's county No. 111 Orkney by Mr. J. R. Hebden in Dr. A. R. Duguid's manuscript "Flora Orcadensis" (1858). See "Scot. Nat.," No. i, new series, p. 22 (July 1883); "Annals Scot. Nat. Hist.," No. 31, p. 166 (July 1899); Bennett, "Suppl. Top. Bot.," ed. ii, p. 76 (1905); and Spence, "Flora Orcadensis," p. 66 (1914).

CLASS II.—MONOCOTYLEDONS.

ORCHIS MACULATA, *Linn.* [ORCHIS FUCHSII, *Druce* (*fide* G. C. Druce, 4th August 1920)].—Pasture at burnside, 30 feet above sea-level, Wideford Burn, Saint Ola, Mainland, 23rd July 1920 and 16th September 1920, H. H.

Johnston. Native. Rare. Stem *solid*. Leaves *spotted* dark purplish-black on upper surface. Perianth *pale purple*, with dark purple lines on lip; two lateral sepals *spreading*; upper sepal and two petals connivent; lip *flat* and 3-lobed, with a *large* middle lobe, *longer* than the two lateral lobes, and *straight* (not *recurved* at the apex as in the subspecies O. ERICETORUM, *Linton*). ORCHIS MACULATA, *Linn.*, is recorded for H. C. Watson's county No. 111 Orkney in Watson, "Top. Bot.," ed. ii, p. 390 (1883), but there is no doubt but that this record was based on plants of the *subspecies* O. ERICETORUM, *Linton*, which is very common in Orkney. Since I began to collect botanical specimens in Orkney in 1874, I have seen many thousands of plants of O. ERICETORUM, *Linton*, in several different islands, but the only plants of O. MACULATA, *Linn.* I have seen in Orkney are those I found at Wideford Burn on 23rd July 1920. In the opinion of Dr. G. Claridge Druce, the *subspecies* O. ERICETORUM *Linton*, is the true type of O. MACULATA, *Linn.*, "Species Plantarum," 1335, and my specimens from Wideford Burn belong to another species, which he has named O. FUCHSII, *Druce*. In O. ERICETORUM, *Linton*, the middle lobe of the lip is *smaller*, *shorter*, and *narrower* than the two lateral lobes, and *recurved* at the apex, whereas in O. FUCHSII, *Druce*, it is *larger* and *longer* than the two lateral lobes, and the apex is *not* recurved. See "Trans. Bot. Soc. Edin.," vol. xxviii, p. 39 (1920).

Narcissus Pseudo-narcissus, Linn. (*fide* C. H. Wright).—Grassy bank at lochside, 140 feet above sea-level, Loch of Wasdale, Firth, Mainland, 22nd May 1920, H. H. Johnston. Not native. Five small clumps of plants only seen by me.

Scilla non-scripta, Hoffingg. et Link [=*Scilla nutans*, Sm., and *Endymion nutans*, Dum.].—Grassy banks at seashore, 5 feet above sea-level, Isgarth, Lady, Sanday, 27th May 1920, H. H. Johnston. Not native. An escape from the garden of Isgarth House. One small clump of plants, in flower, seen by me. Perianth blue. Confirms the record of this species from Orkney in Bennett, "Suppl. Top. Bot.," ed. ii, p. 82 (1905). This species is cultivated in gardens in Orkney, but it is not native, nor has it become naturalised anywhere in the county, so far as I am aware.

CAREX TERETIUSCULA, *Good.* [=C. DIANDRA, *Schrank*] (*fide* G. C. Druce and Arthur Bennett).—Swamp, 130 feet above sea-level, Dee of Durkadale, Birsay, Mainland, 4th August 1920, H. H. Johnston. Native. Rare. A new record for H. C. Watson's county No. 111 Orkney. Mr. G. W. Scarth, in *litt.*, dated 19th September 1919, informs me that the last time he visited the Dee of Durkadale he saw "what looked very like CAREX TERETIUSCULA, *Good.*," but the plants were not in fruit, and he did not preserve specimens of them.

AGROSTIS VULGARIS, *With.*, *var. b.* PUMILA (*Lightf.*) (*fide* G. C. Druce).—Pasture, 170 feet above sea-level, Binscarth, Firth, Mainland, 6th August 1920, H. H. Johnston; and grassy and heathery pasture, 10 feet above sea-level, Point of Onston, Stenness, Mainland, 9th August 1920, H. H. Johnston. Native. Rare at Binscarth and common at the Point of Onston. Confirms the record of this variety from Orkney in Neill, "Tour," p. 184 (1806). See "Scot. Nat.," No. ii, new series, p. 74 (October 1883); "Annals Scot. Nat. Hist.," No. 64, p. 227 (October 1907); and Spence, "Flora Orcadensis," pp. xxv and 86 (1914).

AGROSTIS ALBA, *Linn.*, *var. d.* COARCTATA (*Hoffm.*) (*fide* G. C. Druce and Arthur Bennett).—Short natural pasture near edge of sea-cliffs, 250 feet above sea-level, Black Crag, Stromness, Mainland, 7th August 1920, H. H. Johnston. Native. Common. Confirms Mr. G. W. Scarth's record of this variety from Orkney in Spence, "Flora Orcadensis," p. 86 (1914).

KOELERIA BRITANNICA, *Domin* [=K. GRACILIS, *Pers.*, *var. c.* BRITANNICA, *Domin* (K. CRISTATA, *Pers.* ed. 9) of "Lond. Cat.," ed. x (1908)] (*fide* G. C. Druce).—Grassy banks at lochside, 30 feet above sea-level, Kierfiold, Loch of Skaill, Sandwick, Mainland, 4th August 1920, H. H. Johnston; natural shell-sandy pasture at seashore, 10 feet above sea-level, Links of Boardhouse, Birsay, Mainland, 4th August 1920, H. H. Johnston; and short natural pasture near edge of sea-cliffs, 240 feet above sea-level, Black Crag, Stromness, Mainland, 7th August 1920, H. H. Johnston. Native. Common at all these three stations. Confirms the record of this *subspecies* for H. C. Watson's county No. 111 Orkney, as KOELERIA CRISTATA, *Pers.*, in

"Annals Scot. Nat. Hist.," No. 33, p. 39 (June 1900); "Journ. Bot.," vol. xxxix, p. 274 (August 1901); and Bennett, "Suppl. Top. Bot.," ed. ii, p. 104 (1905); and as KOELERIA BRITANNICA, *Domin*, in "Annals Scot. Nat. Hist.," No. 57, p. 32 (January 1906); and *ibid.*, No. 64, p. 227 (October 1907).

CLASS III.—CRYPTOGAMS.

CYSTOPTERIS FRAGILIS, *Bernh.*, *var. b.* DENTATA, *Hook.*—Clefts of sandstone crags on hillside, 460 feet above sea-level, Dwarfie Hamars, Hoy, 5th August 1920, H. H. Johnston. Native. Rare. Confirms the record of this variety for H. C. Watson's county No. 111 Orkney in "Annals Scot. Nat. Hist.," No. 34, p. 105 (April 1900); and "Journ. Bot.," vol. xxxix, p. 275 (August 1901). I have also collected specimens of the type of the species C. FRAGILIS, *Bernh.*, at two different places on the Wart Hill, Hoy, on 10th July 1877 and 14th June 1920, where it is native and rare and reaches an altitude of 730 feet above sea-level.

EQUISETUM PRATENSE, *Ehrh.* (*fide* C. H. Wright).—Damp natural shell-sandy pasture, Links of the Hall of Sands, Deerness, Mainland, 19th August 1916, H. H. Johnston. Native. Moderately common. Plants with sterile stems only. Confirms the record of this species for H. C. Watson's county No. 111 Orkney in "Annals Scot. Nat. Hist.," No. 67, p. 170 (July 1908); and Spence, "Flora Orcadensis," p. 97 (1914).

CHARA DESMACANTHA, *J. Groves et Bullock-Webster* (*fide* James Groves).—Shell-sandy mud at bottom of water, 1 inch deep, in a loch near the sea, 8 feet above sea-level, Loch of The Rive, Burness, Sanday, 28th August 1920, H. H. Johnston. Native. Common. Plants fetid. "A sterile form with well-developed bulbils" (*fide* J. Groves). Confirms the late Rev. E. S. Marshall's record of this species from Orkney (Loch of Stenness and Loch of Harray in Mainland) in "Journ. Bot.," vol. xxxix, p. 275 (August 1901). See "Annals Scot. Nat. Hist.," No. 64, p. 230 (October 1907); and under the next species, p. 65.

CHARA HISPIDA, *Linn.* (*fide* James Groves).—Shell-sandy mud at bottom of water, 2 inches deep, in a nearly dried-

up loch, 10 feet above sea-level, Loch of Langamay, Lady, Sanday, 27th August 1920, H. H. Johnston; and shell-sandy mud at bottom of water, 3 inches deep, in a loch near the sea, 8 feet above sea-level, Loch of The Rive, Burness, Sanday, 28th August 1920, H. H. Johnston, "a very neat form with the cortical cells of almost equal diameter" (*fide* J. Groves). Native and common at both stations, especially at the Loch of Langamay, where nearly the whole of the bed of the loch was densely covered with it at the time of my visit. Confirms the record of this species from Orkney (Loch of Airy in Stronsay) in Neill, "Tour," p. 184 (1906). See "Journ. Bot.," No. xiii, p. 17 (January 1864); "Scot. Nat.," No. iii, new series, p. 114 (January 1884), where this species is recorded from Brogar on the authority of the late Dr. A. R. Duguid, but a specimen collected by me in the Loch of Harray, near the Bridge of Brogar, Stenness, Mainland, on 24th September 1880, and named "CHARA HISPIDA, *Linn.*," by the late Dr. J. T. I. B. Boswell, has been identified as C. DESMACANTHA, *J. Groves et Bullock-Webster*, by Mr. James Groves; "Annals Scot. Nat. Hist.," No. 34, p. 107 (April 1900); and Spence, "Flora Orcadensis," p. 98 (1914). Specimens of C. HISPIDA, *Linn.* (*fide* James Groves), were collected at the Loch of Langamay ("Longmay marshy loch"), Sanday, on 20th July 1898, by the late Mr. A. Somerville, and I have seen them in the herbarium of Mr. James Groves.

CHARA RUDIS, *Leonhardi* (*fide* James Groves).—Shell-sandy mud at the bottom of water, 2 inches deep, in a nearly dried-up loch, 10 feet above sea-level, Loch of Langamay, Lady, Sanday, 27th August 1920, H. H. Johnston. Native. Plants growing among C. HISPIDA, *Linn.* "Very characteristic" (*fide* J. Groves). The secondary cortical cells of the stem are much greater in diameter than the primary cortical cells. A new record for H. C. Watson's county No. 111 Orkney.

CHARA CANESCENS, *Loiseleur* (*fide* James Groves).—Mud at bottom of brackish water, 5 feet deep, in a loch at sea-level, near the *noust* for boats, Nether Bigging, Loch of Stenness, Mainland, 14th September 1920, H. H. Johnston. Native. Common. With reference to my specimens of this species, Mr. James Groves, in a note dated 18th Nov-

ember 1920, writes as follows:—"This represents an important extension of the range of the species in the British Isles. It is a form with unusually short branchlets. The fruits, of which very few are developed, are shorter and broader than in other British forms." On 2nd August 1920, when in company with Dr. G. Claridge Druce, and searching for specimens of CHARA BALTICA, *Bruzel*, for him, I raked up plants of C. CANESCENS, *Linn.*, and TOLYPELLA NIDIFICA, *Leonhardi*, which Dr. Druce preserved; but, not being aware at the time what they were, I did not preserve specimens of them myself, and it was only after Dr. Druce's specimens had been identified by Mr. James Groves that I knew what their names were, and that both of them were new records for H. C. Watson's county No. 111 Orkney, as published by Dr. Druce in "Bot. Exch. Club Secretary's Report for 1919," Addenda 1920, p. 730 (October 1920).

TOLYPELLA NIDIFICA, *Leonhardi* (*fide* James Groves).—Mud at bottom of brackish water, 5 feet deep, in a loch at sea-level, near the *noust* for boats, Nether Bigging, Loch of Stenness, Stenness, Mainland, 2nd August 1920, G. C. Druce; and 14th September 1920, H. H. Johnston. Native. Common. Plants in fructification. My largest specimen measures 16 inches (40 cm.) in length. With reference to my specimens, Mr James Groves, in a note dated 18th November 1920, writes as follows:—"The first record of the plant for Britain. I have little doubt that the TOLYPELLA collected in Orkney by Mr. A. H. Evans, and recorded as T. GLOMERATA, *Leonhardi*, belonged to this species, but the specimens had only small unripe fruit." Mr. A. H. Evans collected his specimens in the Loch of Stenness in 1911. A new record for H. C. Watson's county No. 111 Orkney, published by Dr. G. C. Druce in "Bot. Exch. Club Secretary's Report for 1919," Addenda 1920, p. 730 (October 1920).

Some Moss Records from St. Kilda. By William Evans, F.R.S.E.

(Read 20th January 1921.)

For reasons one can readily appreciate an island is always a place of interest to the naturalist, and the more remote and inaccessible the greater the interest it arouses. Lying out in the Atlantic, some 40 miles west of Harris, St. Kilda was bound to attract attention, and the chief features of its fauna and flora are already known. Much has been written regarding its wonderful avi-fauna, and in the cataloguing of the insects and other invertebrates considerable progress has been made. The flora, too, has been fairly well investigated as regards the flowering plants and ferns by R. M. Barrington (Journ. of Bot., 1886, p. 213) and A. H. Gibson (Trans. Bot. Soc. Edin., xix, 1891, p. 155). So far as I know, however, the only mosses specifically recorded are three mentioned by James Murray in a note on "Microscopic Life of St. Kilda" (Ann. Scot. Nat. Hist., 1905, p. 94), and three others given in a paper by Dr. C. Gordon Hewitt entitled "A Contribution to a Flora of St. Kilda; being a List of certain Lichens, Mosses, Hepaticae, and Fresh-Water Algae" (ibid., 1907, p. 239).

In June 1905 the Rev. James Waterston, B.Sc., visited St. Kilda and brought back a number of mosses which were submitted to the late Mr. James M'Andrew, a list of whose determinations was given to me by Mr. Waterston, and also one or two additional specimens he collected in 1906. While staying at St. Kilda in September 1911 Dr. W. Eagle Clarke procured some samples of moss for me, and from this material further records were obtained. From the above sources the following list has been drawn up, the letters after each species referring to the name of the collector.

The number of species in the present list is 32, three of them being additions to the Outer Hebrides (V.C. 110) list as shown in the 1907 "Census" of British Mosses. There is a tendency to departure from type in several of the

species, and capsules seem to be but rarely produced. Our information on these and other points is, however, meagre, and it is to be hoped that a fuller knowledge of the Moss-flora of St. Kilda and its attendant islands may be forthcoming before many years are over. My own only attempt to land on St. Kilda was frustrated by a south-easterly gale which caused a heavy sea to run right into Village Bay, where the landing-place is.

Sphagnum cymbifolium, Ehrh.—W.
—— *acutifolium*, Ehrh.—W.
Polytrichum urnigerum, Linn.—C.
—— *juniperinum*, Willd.—W.
—— *commune*, Linn.—W.
Campylopus flexuosus, Brid.—C.
Dicranum scoparium, Hedw.—W., C.
Leucobryum glaucum, Schp.—W.
Fissidens adiantoides, Hedw.—H. Not in "Census" for V.C. 110.
Grimmia apocarpa, Hedw.—M. Not in "Census" for V.C. 110.
Rhacomitrium aciculare, Brid.—M.
—— *fasciculare*, Brid.—W., C.
—— *lanuginosum*, Brid.—W., C.
Ulota phyllantha, Brid.—C.
Breutelia arcuata, Schp.—C.
Mnium hornum, Linn.—H., W., C.
Fontinalis antipyretica, Linn.—M., W.
Pterygophyllum lucens, Brid.—H.
Thuidium tamariscinum, B. & S.—W.
Brachythecium purum, Dixon—C.
Eurhynchium praelongum, Hobk.—W., C.
—— *myosuroides*, Schp.—C.
—— *myurum*, Dixon—W., C.
Plagiothecium undulatum, B. & S.—W., C.
Hypnum stellatum, Schreb.—W.
—— *cupressiforme*, Linn.—W.
—— —— var. *ericetorum*, B. & S.—C. Not in "Census" for V.C. 110.
—— *callichroum*, Brid.—W. Not in "Census" for V.C. 110.

Hypnum cuspidatum, Linn.—W.
—— *Schreberi*, Willd.—W.
Hylocomium splendens, B. & S.—W., C.
—— *loreum*, B. & S.—W., C.
—— *squarrosum*, B. & S.—W., C.

Craigia, a new Genus of Sterculiaceae. By W. W. Smith, M.A., and W. Edgar Evans, B.Sc. (With Pl. I.)

(Read 17th February 1921.)

Craigia, W. W. Sm. et W. E. Ev. Genus novum Sterculiacearum.

Genus inter Sterculiaceas androecii characteribus bene notatum; petalis nullis, tubo staminali vix evoluto vel ad circulum nigrum reducto (unde oriuntur stipites quinque sepalis alterni qui stamina vulgo quatuor atque processus duos (? staminodia) lanceolatos, unum posteriorem alterum anteriorem, stamina includentes gerunt) ab affinibus recognoscitur. Ad Buettnerieas vel ad Lasiopetaleas spectat sed sectione nova dignum esse videtur.

Arbor vel frutex, pube stellata pilis simplicibus mixta. Folia alterna indivisa penninervia. Inflorescentia axillaris cymoso-paniculata. Flores hermaphroditi. Calycis segmenta 5 libera valvata. Petala nulla. Stamina anomala ut supra indicata. Antherae biloculares loculis parallelis. Ovarium liberum 5-loculare. Styli 5 a basi liberi. Ovula multa fere horizontalia semi-anatropa. Fructus deest.

Genus monotypicum in provincia Yunnan crescens.

Craigia yunnanensis, W. W. Sm. et W. E. Ev. Sp. nov.

Arbor parva 6–10·5 m. alta. Ramuli crassi primo dense ferrugineo-stellato-tomentosi, tandem glabrescentes lenticellis subcircularibus albidis bene conspersi. Folia petiolo 3·5–5 cm. longo tomentoso munita; lamina vulgo 12–15 cm. longa, 8–11 cm. lata, ovata, apice breviter acutata, basi paulo cordata vel subtruncata, margine denticulis crebris subregulariter praedita, in sicco papyracea tactu aspera,

supra in maturitate ad costam nervosque dense stellato-tomentosa ceteroquin sparsim, infra pilis stellatis subferrugineis vel fulvidis ubique densiuscule induta; nervi vulgo 7–8 paria utrinque paulo eminentes. Inflorescentiae 4–6 cm. longae foliis multo breviores cymoso-paniculatae 20–40-florae; pedunculi primarii breves cum pedicellis circ. 5 mm. longis dense fulvo-stellato-tomentosi. Sepala 5 libera valvata circ. 7 mm. longa, ovato-lanceolata, subacuta, textura firma, extra et ad marginem intus fulvo-tomentosa; pars media faciei interioris lanceolata indumento tenuiore signata. Petala desunt. Tubus staminalis ad circulum nigrum reductus a quo procedunt stipites quinque nigri circ. 1 mm. longi quorum ad apices stamina vulgo quatuor inserta antheris bilocularibus vix 1 mm. longis longitudinaliter dehiscentibus filamenta glabra subaequantibus; sub insertione staminum processus duo (staminodia ?), unus anterior, alter posterior, circ. 4 mm. longi, lanceolati, submembranacei, appressi atque stamina omnino includentes. Ovarium ovoideum circ. 3 mm. longum dense fulvo-tomentosum 5-loculare ovulis multis angulo interiori affixis anatropis; styli 5 liberi circ. 1 mm longi.

"West China: — Mekong-Salween divide, Yunnan, in mixed thickets in side valleys. Lat. 26° 10′ N. Alt. 8000 ft. Shrub of 20–35 ft. Flowers deep creamy yellow. July 1919." G. Forrest. No. 18,409.

"Shweli valley, Yunnan, in forests. Lat. 25° N. Alt. 5000 ft. Tree of 30–50 ft. Perianth thick and fleshy, exterior dull pale brown with a short pubescence, interior dull lake; anthers golden-yellow, in fours enclosed in pairs of small leafy bracts which are deep brown; ovary green. July 1912." G. Forrest. Nos. 8841, 8253.

In foliage and inflorescence *Craigia* recalls certain species of Sterculia. The androecium is characteristic. The staminal ring is not developed but is represented by a black circular band from which arise five short stalks bearing two lanceolate petal-like structures, probably staminodes, appressed to one another and each pair closely enveloping a group of four stamens.

The generic name is in honour of William Craig, M.D., F.R.C.S.Ed., F.R.S.E., Honorary Secretary of the Botanical Society from 1900–1912; President of that Society for

Craigia yunnanensis, W. W. Sm. et W. E. Ev.

W. W. Smith and W. Edgar Evans.

1887–1889; at one time lecturer on Materia Medica in the Royal College of Surgeons; a member of the Scottish Alpine Botanical Club; and an enthusiastic student of the flora of Scotland.

EXPLANATION OF PLATE I.

1. Inflorescence, × ½.
2. Underside of leaf, × 2.
3. Hair on underside of leaf, highly magnified.
4. Longitudinal section of flower bud.
5. Ovary, × 3.
6. Cross-section of ovary, × 4.
7. A staminal stipe opened up, × 3.
8. Stamen.

Pyrola rotundifolia, Linn., in Caithness, with Notes on the Genus. By Arthur Bennett, A.L.S.

(Read 10th December 1920.)

In June 1920 Mr. Bain sent me a specimen of a *Pyrola*, remarking that it seemed different from the *P. media* of the Wick river banks. It was in poor condition, but I at once thought it *rotundifolia*, writing Mr. Bain so with a query. In a week he sent me 6 specimens, and 6 of *media*, all in splendid order. There was now no doubt it was not *media*, but the colour of the flowers—greenish-white with green veins—suggested *P. chlorantha*, though the calyx segments and anther cells denied this. All other *rotundifolia* I had gathered (and that many) were white-flowered, and all the books say white. Colonel Johnston writes me that the Orkney plant has white flowers. On referring to the Scandinavian Floras one finds a var. *chloranthoides*, Norrlin (Fl. Kareliae Onegensis, ex Faun. Flor. Fenn. Notiser, xiii, 1871–4, p. 160) and a f. *chloranthiflora*, Noto in herb. = var. *pumila*, A. Bl. (Norges Flora, 1906, p. 550) (not of Hornem., which is *P. grandiflora*, Radius, and has smaller leaves, and a greenish flower, etc.). The forma occurs in Russian Lapland (Lapponia ponojensis), *c.* 67° N. lat., and in the province Kuusamo, and also at Seida ad Tenojoki in E. Finmark, Norway, the type being found in the whole of

Finland except one extreme northern province (Lapponia murmarica). The Caithness specimens agree with the Norwegian f. *chloranthiflora*, and Hjelt (Flora Fennica, v, 1919, p. 345) says that perhaps his var. *chloranthoides* may be the Norwegian f., or it may be a local form.

It grows in Caithness, 7 miles west of Wick, on the banks of the Strath Burn, a tributary of the Wick river, between Strath and Scorriclett. At this point the vegetation is luxuriant. Dr. Crampton, in his Vegetation of Caithness (1911, p. 95), giving a list of 49 representative species, includes among them *Erica cinerea*, *Vaccinium Myrtillus*, *Salix repens*, and *Luzula sylvatica*. The banks of the river rise to 20–30 feet on either side, and are composed of Calcareous Flagstones and Shelly Boulder Clay (Crampton, *l.c.*). *P. media* grows near, as Mr. W. Sutherland sent me specimens some years ago from Scorriclett. We know that *rotundifolia* occurs in the Orkneys, but *media* is recorded from Shetland. Mr. Sherrin, the Curator of the South London Botanical Institute writes me: "There is no *Pyrola* in the late Mr. Beeby's collection of Shetland plants." Edmonston at first recorded *rotundifolia* from Shetland, but in his Flora altered it to *media*, and in the second edition of the Flora (1903), p. 74, it still stands as *media*. All the Caithness *media* had the flowers with a decidedly rosy tint. I have seen no other British specimens of *rotundifolia* like the Caithness ones. Those from Sutherland (Marshall sp.) and Aberdeen (Trail sp.) are quite typical. Here it will be well to correct an error of mine, *i.e.* *rotundifolia* as growing close to the Caithness border near the Ord (Ann. Scot. Nat. Hist., 1904, p. 232); the specimen is *P. media*! There is another fact with regard to the Caithness examples: the first specimen was gathered on the 2nd of June, the others on the 17th. On 2nd June, in Norfolk, the head of flowers was only short, with the bracts projecting and no sign of a flower. Dickie, in his Guide to Aberdeen, Banff, and Kincardine (1860), gives "July and August." In Iceland in flower on 1st July. Syme (Eng. Botany, ed. 3) says "late summer and autumn." On 16th August 1912, it was still in flower at the Grande Mare, Guernsey. Its habitat is given in our Floras as "Woods and bushy reedy places," "Damp bushy places and reedy

marshes." In Ireland, "Wet bogs." In the United States the Floras all give "Dry woods," and the marsh and bog plant is *P. uliginosa*, Torrey. Yet their summer is far hotter than ours.

P. rotundifolia, Linn., var. *arenaria*, Koch.

In the Hookerian herbarium at Kew there is a sheet of 8 specimens named "var. *bracteata* Hook. & Arn. 1850" (Brit. Fl., ed. 6, 1850, p. 276). They are slender specimens with about 4 flowers on each, and with 7 to 13 bracts on the stem, and the leaves about half the size of the usual Lancashire specimens, probably gathered in a season when the "slacks" were drier than usual. In Linnaea, xxviii (1856), Dr. Alefeld has a long paper on the genus, splitting it up into genera, naming this variety "*Thelaia intermedia*."

The synonymy of *arenaria* is rather extensive :—

var. *arenaria*, Koch, in Syn. Fl. Germ. et Helv., ed. i (1837), p. 478.

P. maritima, Kenyon in Phyt., ii (1847), p. 727.

P. serotina, Melicocq in Ann. Pas-de-Calais (1848–9), p. 223.

var. *serotina*, Melicocq in Bull. Soc. Bot. Fr., i (1854), p. 162.

var. *squamosa*, Hook. in herb. ex Alefeld.

P. arenaria, Dum. Bouq. litt. Belge (1869), p. 41.

f. serotina, Junge, in Verh. Naturw. Ver. Hamburg, xvii (1909), p. 34.

f. pyramidalis, H. Andres, in Mitt. Bay. Bot. Ges., ii (1911), p. 339.

In the Phytologist (1853), p. 1119, Professor D. Oliver gives a translation of a paper by Planchon from the Ann. des Sciences on the above, and mentions that "Sir W. J. Hooker received from some correspondent a *Pyrola* gathered on the Yorkshire coast, and since found on the shores of Lancashire by Kenyon." On this Mr. J. G. Baker remarked in litt.: "*P. rotundifolia* grows in Castle Eden Dene, which Sir W. J. Hooker erroneously supposed to be in Yorkshire —but it is in Durham." The Castle Eden plant has the lower bracts large, etc., like the Southfleet plant. I have not seen any specimen from the adjacent station "on the coast near Hordean Hill," and wish someone would look it

up again. This seems to be the plant that Babington refers to (Journal of Life, 1897, p. 298), in a letter to Professor J. H. Balfour as received by him in 1846, gathered by Brand (1807–1869), as he writes: "You have sent me a puzzle; is it indeed from Yorkshire?" Babington referred it to Kenyon's *maritima*.

Alefeld says his plant is described from 2 specimens of Karelin and Kiriloff (Enum. pl. Soong., No. 539, 1841), 2 of v. *albiflora* in herb. Hooker, 8 from Scotland in herb. Hooker (evidently an error for the Lancashire sheet), and 3 from Vallais. Nyman separates *arenaria* from *maritima*, giving "Scotland" for the first, evidently from Alefeld, and "Angl., Belg." for the latter. But I do not think there is any real difference between the specimens from the Isles of Borkum and Nordeney and the Lancashire ones. And Dumortier (Bouq. litt. Belg., 1869, p. 41) identifies the Belgian plant with Koch's *arenaria*. The earliest Lytham specimens I know of are in the York. Phil. Soc. Herbarium, "S. Hailstone, 1800."

P. media, Swartz.

This occurs in Caithness. On the Wick river at intervals! Reisgill Burn, Thurso river above Giese. Lybster Burn! Side of Ben-a-chielt, *c.* 942 feet! Scorriclett!

In his Prod. Fl. Brit., part 8 (1911), p. 471, Dr. Williams says, "from Wyre Forest, Worcestershire, northward to the Shetland Isles." But its southern limit is Sussex, whence I have specimens gathered by my late friend Mr. Beeby.

This seems to vary little.

P. minor, Linn., var. *arenaria*, Lant.-Boninga, Beit. Kenn. Fl. Ost-frieslands (1849), p. 40.

Ardeer Sandhills, Ayr. Mr. J. Smith sp.

"The spot is now threatened by the extension of a dynamite factory." Williams, Prod. Fl. Brit. (1911), p. 472.

P. secunda, Linn.

"var. *dispersiflora* racemo floribus dispersis vel subdispersis (non secundus), quae varietas primo sat insignis videtur, sed transitus non desunt." Norman, Loco. Nat. spec. in Arct. Norweg. (1864), p. 26.

Although all floras say of the type "raceme secund," this var. can hardly be more than a form. I have seen no British specimens that answer to this.

I believe that the species of this genus are semi-parasitic, see Vuyck, Die Plant. der Dunien (1898), p. 189, and MacMillan, Minnesota Plant Life (1899), p. 89.

The following additions to the distribution have accrued since Supp. to Top. Botany :—

P. rotundifolia.

80. Roxburgh, Sec. Rep. Bot. E. Club, 273, 1916.*

P. media.

40. Salop; Phillips, 1899. 102. Ebudes south, Somerville.

P. minor.

81. Berwick; Ann. Scot. Nat. Hist., 99, 1907. 101. Cantire; *ibid.*, 172, 1906.

P. secunda.

41. Glamorgan; Carr. sp. 42. Brecon; Knight sp. 69. Westmoreland; Baker in N. Yorkshire. 80. Roxburgh; Edinb. herb., 1837. 83. Edinburgh; *ibid.*, Parnell. 85. Fife; W. Arnot, 1839, Herb. Edinb. 102. Ebudes south, Somerville!

In the Supp. to Top. Botany 57, "112. Shetland" under *P. rotundifolia* is an error, the reference there is to Orkney.

It is possible that some day *P. chlorantha*, Swartz, may be found in Scotland: it has broad, short calyx segments and anther pores like *P. uniflora*. Its European distribution is not against its occurrence with us.

Vaccinium Myrtillus, Linn., var. pygmaeus, Ostenfeld, f. microphylla, Lange, in litt. to Beeby. By Arthur Bennett, A.L.S.

(Read 10th December 1920.)

This very small forma was gathered by the late Mr. A. Somerville on Ben Bharrain (2345 feet alt.), Isle of Arran, 8th August 1904. It was recorded from Saxa Vord

* See also Trail in Trans. Bot. Soc. Edin., xxii (1903), p. 296.

Hill, Unst, Shetland, by the late Mr. Beeby, in the Scottish Naturalist, new series, iii (1887), p. 27. It is only 2·50 cm. high, with leaves 5 mm. × 3 mm. As Mr. Beeby notes, it quite simulates the growth and aspect of *Salix herbacea*, Linn. Even on Glywdr-Fawr, Snowdon, at 3270 feet, *V. Myrtillus* is 14 cm. high, and on Glywdr-Fach at 3250 feet it is 15 cm. high; both gathered by the late Mr. C. B. Clarke! In the Faroes it occurs amongst moss on the highest plateaus of the low hills (Ostenfeld in Botany of the Faroes (1901), p. 57, and fig. 23*a*; Bot. Tidssk., xx (1896), p. 150, and fig. 2*a*). Mr. Beeby gathered an analogous form of *V. uliginosum* on Saxa Vord Hill with leaves 7 mm. × 4 mm., that differs much from an Orkney one (Birsay, J. Spence sp.), which has leaves 13 mm. × 12 mm. (f. *rotundata*), the typical Orkney plant having them 17 mm. × 8 mm.

TRANSACTIONS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXVI

Presidential Address—Agricultural Botany in the Past Fifty Years. By W. G. Smith, B.Sc., Ph D.

(Read 20th October 1921.)

A presidential address is an opportunity to look around and survey some branch of knowledge. From time to time this has been done by predecessors in this chair. It is like looking over a countryside from a high view-point —one can observe the lie of the land, neglecting minor details. To deal with the whole field of botany is too large a task, hence I propose to limit myself to things that in my opinion have helped to establish what is called agricultural botany. A further limitation to a fifty-year period, back to about 1870, seems justifiable, as it avoids groping through a somewhat scanty period of literature that marks the evolution of order out of chaos. About fifty years ago an agricultural botanist was defined as someone who knew a little of agriculture, and less of botany. That does not hold good now, for many of the more recent problems concerned with soil science, plant nutrition, heredity, and pathology require a thorough knowledge of the latest researches in botany, and a good deal of cross-reference to chemistry, zoology, and bacteriology, even to higher mathematics in calculations referring to heredity and the probable error in field experiments.

Crop Plants—No new cereals have been introduced

since 1870. Wheat, barley, and oats still occupy the cornfields, increasing or decreasing according to demand and price. The tendency has been for grassland to replace cornland, and the increase of corn fostered during the years of war is already disappearing. Rye, the important crop of middle Europe, has made some progress in certain districts. There have been great changes in the varieties of cereals, so that very few of those widely grown in 1870 are on the market now. To introduce an old variety under a new name is not unknown, but as regards cereals there has been a real change into new types with a higher production or otherwise better for the farmer. The search for new varieties was never more active than at present. The potato was an established crop-plant fifty years ago. Gerard described it about 1596, and predicted a great future, but in 1700 it was still a despised plant "fit to be grown in the worst part of the garden" (Evelyn). After 1750 the cultivation of potatoes rapidly increased, and by 1850 Lawson had described and prepared models of numerous varieties.[1] From 1845 to 1875 growers were much discouraged by the ravages of potato blight, but the past fifty years have seen considerable progress in means for checking that disease. Since 1870 the names of potatoes have changed again and again, old varieties have been replaced by new, and the present time is a period of speculative activity when new varieties appear every year, claiming to be immune from "wart" disease. In this connection it is noteworthy how the departments of agriculture have quickly tackled this serious disease, so that its ravages have never reached the disastrous "blight years" about 1870. Flax and sugar-beet are crops that can be grown in Scotland, and their neglect as crop-plants may look like indifference. It is, however, mainly a problem of supply and demand. Both crops entail much labour for the grower, and the produce requires to be manufactured. The factory depends on the grower, and the grower on the factory; and if the latter cannot repay the farmer, then he cannot grow the crops.

The past fifty years have brought a great change in the

[1] A collection of Lawson's models is now in the Edinburgh and East of Scotland College of Agriculture.

laying down of grassland. An early method was to grow corn till the land was foul, then it was left to become a grassland of some sort. Another method was to sow the sweepings of the hay-loft. Later came the practice of sowing rye grass and clover seeds, and this was almost universal fifty years ago. About 1870 "natural grasses" were much discussed, but it was only the pioneer who ventured to use them. Now every farmer knows something of cocksfoot, timothy, and other grasses, and many are experimenting actively to obtain the most productive grassland for their farms. In recent years great results have been obtained by using "wild" white clover, and there are indications that the red clover seed now in use will be replaced by better strains of "wild" red clover.

Nutrition of Plants.—During the seventeenth century Van Helmont, Priestley, and others founded this branch of botany, but even in the early part of last century there was no clear view how a plant obtained its food supplies. About 1840 the forceful Liebig and his pupils established the "mineral" theory of plant nutrition, and this was eagerly adopted by agricultural science, so that nitrogen, phosphates, potash, and calcium became part of the ordinary talk of the market-place. A result of this period was a worship of the chemical analysis and a serious neglect of the living plant. There is still a remnant of this sentiment, but one of the greatest advances of the past fifty years has been the recognition that the living plant is not understood when it has received a name. Our period has seen a marked extension in the accommodation for botanical teaching and study in almost every university, including the Scottish ones. Much of this development has been in the direction of plant physiology. The publication of Sach's lectures in 1865 brought order out of chaos, and the textbook "Physiology of Plants," by Vines in 1886, first revealed to English readers this important new domain of botany. There can be no doubt that experimental physiology has been of great importance in the successful growing of crop plants.

Soil Biology.—Another great development is the recognition that not only is there life in the plant, but there is life in the soil. About 1870 Pasteur suggested that the

formation of nitrates and ammonia from farmyard manure is not a simple chemical process, as Liebig taught, but that it is due to bacterial action. The chain of evidence has been forged link by link, so that now we recognise that the soil contains innumerable minute organisms (bacteria, etc.) all actively changing the soil, either improving its fertility or diminishing it. The soil is like the plate of nutrient jelly of the bacteriologist, the important part is the food for the living organisms. The mineral particles, sand and clay, are mainly a skeleton to carry the jelly or colloid, and to control the supply of air and water. The word colloid was first used by Graham in 1861 in his studies of liquid diffusion. Colloids have great powers of absorption, hence excess of colloid, as in a peaty soil, leads to a poor crop (*e.g.* heather), whereas the proper colloidal state assists fertility. The utility of soil micro-organisms was demonstrated in one direction by the experimental work on the root-nodules of Leguminosae, chiefly that of Hellriegel and Willfarth described in 1885. Another step was the recognition of nitrification, the formation of nitrates by soil bacteria. This was first suggested by Warington at Rothamsted in 1879, and since then his views have been confirmed that the nitrogen of organic matter is made available for green plants by the activity of soil micro-organisms. The pioneer work on mycorhiza (fungus-roots) on trees by Muller in Denmark, about 1878, opened another aspect of plant nutrition. This has been extended, so that now a number of species are known to supplement their food supply with the assistance of fungi in the soil.

Apart from symbiotic organisms, there is evidence that the plant bears a relationship to the soil that cannot be expressed in terms of abundant or deficient nitrogen, phosphate, etc. When plants are grown under close observation, great differences are known to exist; one soil is fertile, another is infertile. This problem has not yet been solved, and it is too early to say yet which of the methods now being tested, if any, will form the test of soil-fertility.

Plant Breeding.—Rather more than fifty years ago Darwin's "Origin of Species" brought together numerous

records and opened the way for an important development. Plant breeding of crop-plants was carried on by Vilmorin about 1850, and later by others like Garton, but in these commercial enterprises it was not to be expected that the actual methods would be adequately disclosed. About 1870 Denmark became the leader in State organisation of agricultural research, and the example has been followed by other countries. Sweden in 1886 established a seed association in connection with the plant-breeding work at the experimental farm at Svälof, and at the present time two of the more productive oats in Scotland—Victory and Crown—are varieties obtained at Svälof within the present century. Plant breeding in Ireland during the same twenty years has entirely changed the varieties of barley grown there. Similar work by State departments in Canada and the United States has greatly increased the yield and value of wheat and oats in North America.

Two chief methods are used in plant breeding: selection or the search for new varieties as variations or mutations from existing races; hybridisation to combine the characters of parents, followed by selection of the more useful progeny. Neither of the methods is new. Pliny (23–79 A.D.) describes cabbage, tall and dwarf kale, kale-sprouts, and kohl-rabi, all varieties obtained by continuous selection from the wild cabbage. In 1597 Gerard illustrated red and white cabbages, brussels sprouts, and cauliflower, in all fifteen varieties. Numerous varieties of farm and garden crops were described by Lawson of Edinburgh in 1850, mostly the produce of selection. Now plant improvement by selection can be carried out more rapidly and with fewer mistakes. Hybridisation has, however, made very distinct progress in the last twenty years. Kohlreuter (1760–1766) established the importance of insects and wind as agents in cross-pollination. Thomas Andrew Knight in 1779 published his results in crossing peas and various fruit trees. Other landmarks are Gaertner's book in 1849 and Naudin's Essays in 1862. Charles Darwin, in gathering material for his "Origin of Species" (1858) brought together much information on plant breeding by hybridisation and by selection. About 1860 it is evident that much was known, but the knowledge

was vague and the principles were little understood. The whole subject assumed new interest after Gregor Mendel's experimental work. Mendel (1822–1884) made experiments, mainly on peas, and published his results in 1865, but the paper was overlooked till 1900, when translations appeared in several countries. Numerous investigators made new experiments, and the past twenty years will always stand out as a historical period in hybridisation. It is too optimistic to assume that Mendel's Laws have solved all the difficulties, but it is safe to say that they mark a great stride. As a result, it is possible to raise new varieties of crop-plants within a few years. If one variety has high yielding powers and another variety has, say, hardiness, these can be combined by methods which are now fairly well understood. Thus the leading barley in the Lothians, "Plumage Archer," is a cross made in 1905. Biffen's crossings of wheat since 1900 have yielded varieties with superior baking qualities, and others that are resistant to wheat rust.

Pathology.—The study of disease in plants has made great progress. Previous to 1870 much had been done in identifying fungi, insects, and other parasites on plants, but far more attention was given to the fungus or other organism than to the plant affected. In the early nineteenth century Link was doubtful whether the spores of fungi could germinate. Persoon in 1818, while admitting that some fungi arose from spores, resorted to spontaneous generation to explain the origin of others. The real awakening came from France, when the brothers Tulasne, between 1850 and 1865, worked out the life-history of rusts and smuts, of ergot, and the sexual organs of Peronospora. The newer school of plant pathologists owe much to De Bary and Brefeld and their pupils, so that the present era of accurate laboratory methods, pure cultures, and inoculation had their origin since 1870. It was not, however, till about twenty years ago that our universities extended facilities for teaching and research in plant pathology, and the stimulus came mainly from the agricultural schools. The recognition of the value of colonial crop-plants has given great opportunities to many of our home-trained mycologists, so that within recent years a

huge literature has been created on the diseases of rubber, tea, coffee, sugar-cane, cotton, etc.

The treatment of plant diseases may be described as a collection of scraps of experience, up till the early part of the nineteenth century. Sulphur as a fungicide for peach mildew was known in 1821, and the combination of lime and sulphur used in 1851 was the beginning of the lime-sulphur fungicide so much in use now. The use of copper sulphate against fungi may have been known earlier, but it was Millardet of Bordeaux who, about 1885, realised the merits of a combination of copper and lime in the well-known "Bordeaux mixture." Formalin does not appear in books as a fungicide till after 1896.

Our knowledge of plant hygiene or how to keep plants healthy is still mainly empirical. A promising beginning has been made with "immune varieties." The results obtained in France, about 1890, through using vines of American origin, by grafting or by hybridisation, attracted attention. Eriksson in Sweden, MacAlpine and others in Australia, and Biffen at Cambridge have attained good results with varieties of wheat immune to rust. In more recent times the success of varieties of potatoes immune to wart disease has saved this country millions sterling. The discovery of immune varieties is an important branch of plant breeding which, combined with modern methods of mycology, render it probable that the future will combat plant disease by preventing it.

This brief survey may suffice to emphasise that the progress of applied botany depends on the utilisation of the latest researches of botany as a whole. Conversely, that the stimulus to further investigation in botany may come from the problems incidental to agriculture, forestry, and horticulture. Taxonomy or systematic botany has raised men skilled in detecting the differences in varieties so essential in plant breeding. Plant physiology with its laboratory equipment has placed the understanding of plant nutrition and plant response on a firm basis. Ecology, in its endeavours to ascertain the relation of plant to soil and climate by a study of the native plants, has led to a better concept of the utilisation of land for economic purposes. Mycology is saving millions sterling of crops

that might have been destroyed by fungus pests. The linkage of so-called "practice and theory" should be self-evident, if there ever was any doubt about it. The past fifty years have seen ever-increasing specialisation in the various branches of botany, almost a separation of the schools. Yet the same period has seen the evolution of agricultural botany and other collateral branches of the parent botany, where the purpose is to join together link by link the facts bearing on the problems peculiar to the economic need.

NOTE ON A SEEDLING OF CYTISUS ADAMI.

By T. BENNET CLARK, C.A.

(Read 17th November 1921.)

I should explain that I have come to submit this note on a seedling of *Cytisus Adami* as the outcome of my having attended, at the recent Edinburgh meeting of the British Association, an interesting lecture by Professor Weiss upon "Graft Hybrids," a subject which has for a long time interested botanical students, and as to which I believe there is still a great deal to be discovered.

The pink-flowered Laburnum, *C. Adami*, is a graft hybrid, and propagation is secured by grafting the hybrid on Laburnum stock — the common yellow-flowered Laburnum or one of its varieties,—and in this way nurserymen maintain their supply of the shrub.

I might perhaps refer to the history of *C. Adami*. In 1825 a gardener called Adam, who was interested in grafting and budding, had budded on a yellow Laburnum a shield or bud of the well-known *Cytisus purpureus*, a low-growing and rather spreading shrub with purple flowers in the axils of the leaves of the young wood—the plant being rather a subject for the rock garden than for the shrubbery. I have been told that it had been the custom to graft or to bud this plant on a Laburnum stem as a standard, and the *C. purpureus* grew and flowered at the top much like a Standard Rose. But this particular bud of Mr. Adam's "did not take," as a gardener would

say, and on the Laburnum stem near where the bud had failed there appeared a strong shoot which bore narrow leaves distinctly different from the leaves of the Laburnum stock and resembling the smaller and narrower leaves of *C. purpureus*. This shoot was allowed to grow, and eventually it bore flowers in racemes of a dull pink colour. Grafts from this strange development were made on other Laburnum stocks, and these as they developed preserved the habit and flowers of the original "Graft Hybrid."

Not uncommonly some of the branches of this graft hybrid revert to the original forms from which the hybrid is supposed to be derived, and so there comes about the curious development of the same tree bearing three kinds of flowers and foliage. This peculiarity had developed on Mr. Adam's original budded tree, a development which is maintained in most of the trees raised from *C. Adami* by grafting.

Some fifteen or twenty years ago, when I was planting a few flowering shrubs I included among them the pink Laburnum, *C. Adami*. It was then all pink flowered, but a few years later it showed the yellow-flowered branches, the original Laburnum of the stock breaking out, and it has now broken out very largely in spite of much pruning. Only in the last year or two are there small pieces of the purple Cytisus appearing on my tree, but not to any extent.

This is all preliminary, and I come back to Professor Weiss's most interesting lecture. When dealing with *C. Adami* he explained, what I had already found out, that the pink racemes are almost invariably barren, none of the seed pods filling up. He further explained that when the seed of the yellow-flowered portions are planted the resulting trees are always just the yellow Laburnum, and in fact all seedlings from *C. Adami* that have so far been recorded are of the pure yellow type.

Having failed to find any seed of the pink flowers, which I frequently looked for, I thought I would try to see what was produced from a handful of well-filled pods from the yellow portion of my *C. Adami*. I think about forty seeds were sown, and I was rather pleased to find that one of the seedlings had the smaller and narrower and the somewhat darker leaves of the pink-flowered part of

the parent. After keeping this seedling tree for some years under observation, I found, to my regret at the time, that it produced rather short yellow-flowered racemes, and not the pink ones as I had hoped. But I was much interested to note that as the tree grew it always preserved the peculiarity of these narrow leaves, and, to a very large extent, the habit of the pink parent, or rather of the pink-flowered part of the parent. I then relegated the tree to the border of a planting at Newmills. I had kept about a dozen of the other seedlings to see if anything should happen among them, but they are all ordinary Laburnums.

When I heard Professor Weiss's record of information as to the result of sowing seed such as I had sown, I interviewed him after his lecture and told him all about my tree. Later I provided him with specimens, and of what he has called "this very remarkable plant" he intends to make a careful examination. He also writes, "I must say I have not seen any more interesting specimen in connection with *C. Adami* than the seedling with the foliage of the purple hybrid."

I have now made a careful examination of my seedling tree to see if the flowers had set, and, as it was rather late in the season, I found only one seed pod containing three apparently fully matured and healthy seeds. I shall see what these may produce in due course. I cannot undertake to give any opinion as to why one of the forty seeds should have produced this tree of very distinct habit and foliage from all the other seedlings of the same gathering —a habit distinct from Laburnums generally, which it has shown and kept from the time it started. Further, I may say that although my seedling tree has not yet produced any pink racemes, I am not without hope that it may do so. At all events I am assured that my tree is a "new departure," and for that reason I have thought it was of sufficient interest to submit this note to the Society.

Salicornia dolichostachya, Moss, in Scotland. By E. J. Salisbury, D.Sc., F.L.S.

(Read 17th November 1921.)

Up to the present no record of *Salicornia dolichostachya*, Moss, has been made for Scotland, although the species occurs in Denmark. When visiting the salt marsh near Gullane, however, with Section K of the British Association (September 1921) this species was found by the writer growing in its normal habitat, namely, near the seaward limit of the salt marsh. In the higher parts *Salicornia herbacea* occurred in some quantity, both the *forma stricta* and the *forma patula* being present, though the first named was by far the more abundant.

The plants of *Salicornia dolichostachya* were quite typical, exhibiting the long, blunt, tapering spikes in which the lateral flowers are almost or completely separated by the central one. In one specimen a very rare and interesting abnormality occurred, the partial dichasium consisting of four in place of three flowers. The supernumerary flower was central in position, so that two superposed flowers completely separated the lateral ones. In several specimens the accessory spikes, which are so characteristic of this species, were present. They arise from below and at the base of the sterile segments of the main lateral spikes.

As might be expected from the presence of both *S. herbacea* and *S. dolichostachya*, a few intermediates occurred, which probably represented hybrid offspring, and in which the central flower did not separate the lateral ones.

Notes on Pinguicula. By Arthur Bennett, A.L.S.

(Read 17th November 1921.)

Pinguicula alpina, L.

In the Secretary's Report of the Bot. Soc. and Exc. Club for 1919, p. 671, he remarks that this species is "now extinct at Avoch, E. Ross, owing to seedling conifers

drying the bog in which it formerly grew. No actual habitat now known." This seems to ignore the W. Sutherland station recorded in Journ. Bot. (1885), p. 311.

The place of growth in E. Ross has been described in various ways and under various names. The record in English Botany, Suppl. 2747 (1832), is not correct. The first record is given by Dr. Murray in his Northern Flora (1836), p. 17, as follows:—"Mr. G. Campbell Smith, Land-surveyor at Banff, . . . first observed *Pinguicula alpina*, in June 1831, upon Rosehaugh property (part of the Black Isle of Ross, lying between the Friths of Beauly and Cromarty), which he was then surveying for Sir James W. Mackenzie." Murray further remarks (p. 17) that "Mr. Smith communicated his specimens to Mr. Gordon, Minister of Birnie, who visited the quarter mentioned during the same summer; and, subsequently, other discerning botanists had an opportunity of inspecting the plants, gathered either by Mr. Gordon or Mr. Smith, but these not being closely examined were merely regarded as *P. lusitanica* from a new and remarkable habitat. The credit of ascertaining this to be a new Pinguicula is due to Mr. H. C. Watson, who decided it to be *P. alpina* of Linnaeus."

Other records are:—"Near Loch Avoch" (G. Gordon); "Raddery Moss in Rosemarkie parish" (Dr. Nicholson); "Bogs of Auchterflow and Shannon on the Rosehaugh property" (G. Gordon); "Munlochy Bay and Invergordon in the Black Isle" (Anderson's Guide).

In Watson's herbarium at Kew are specimens labelled "Strath of Auchterflow, parish of Avoch, along with *Thalictrum alpinum*, on a moor surrounded by cornfields behind Rosehaugh House" (W. A. Stables, 1843); "Marsh on the Millbuie Ridge" (W. A. Stables, 1845).

In Watson's Outlines of the Distribution of British Plants (1832), p. 234, the following note is given under *P. alpina*:—"In a sheet of *P. lusitanica* in Sir J. E. Smith's herbarium is one marked by Sir J. E. Smith 'Isle of Skye, 1794—Mr. J. Mackay,' which is certainly *P. alpina*. Mr. David Don told me that he well remembers his father finding a Pinguicula in Aberdeenshire or Angus which he considered *P. alpina*, but it does not appear that he pre-

served specimens"—*W. Christy.* In Hooker's Brit. Flora, ed. 3 (1835), p. 10, there is the following footnote:—"Dr. Graham says, 'I understand there are two specimens in the herbarium of Sir J. E. Smith upon the same paper with *P. lusitanica*; marked as sent by Mr. James Mackay, in September 1794, from the Isle of Skye.'"

Dr. Williams in Prod. Fl. Brit. (1909), p. 351, remarks: "I have examined these two specimens in Sir J. E. Smith's herbarium at Burlington House. They seem to me rightly placed in *P. lusitanica*, and they certainly do not match a specimen of *P. alpina* from Swartz on the next sheet."

Mr. J. T. Johnstone of the Edinburgh Botanical Society informs me that the latest specimens they have knowledge of from the Black Isle are dated 1863, and I have specimens gathered in that year by Mr. G. N. Stables. Mrs. Wedgewood and Mr. C. E. Salmon visited the Ross station (enclosure behind Rosehaugh House) in 1916. The innkeeper told Mrs. Wedgewood that the plant had gradually disappeared. In the spring of that year only two or three weak plants had come up and had withered away very soon. The enclosure is now grown over by *Calluna* and *Erica Tetralix* and planted with conifers. *Pinguicula alpina* thus seems to have disappeared from the Black Isle, where it has been known to exist since 1831.

In the north of Europe the species is rare in Sweden, in Gotland, and in S. Lapland. It occurs in five provinces of Russian Lapland and two of Finnish Lapland; N. Norway: Faroes (?) (not given by Ostenfeld); Iceland (?), Stefansson's Flora Islands does not name it.

P. GRANDIFLORA, Lam.

In the Trans. Bot. Soc. Edin., xxiii (1908), p. 251, Canon Spence Ross states that the above species occurs in the Black Isle near Fortrose and Ferintosh by Dingwall. But are these specimens not large-flowered *P. vulgaris*?

P. grandiflora, regarded as a native in Cork and Kerry, has established itself in Cornwall, where, according to Davey, Fl. Cornw. (1919), p. 345, it occurs abundantly, having spread from plants originally planted by Dr. Ralfs on Tremethick Moor.

P. LUSITANICA, L.

Babington in the first edition of his Manual (1843), p. 239, remarks: "*P. villosa*, distinguished from this (*lusitanica*) by its acute spur and obconical capsule, may be expected in the north of Scotland." The distribution of *P. lusitanica* in Europe is very limited—Portugal, Spain, and France, west and north. Usually a lowland species, it occurs in Ireland on the Mourne Mountains at 1560 feet. It is found in 31 of the 40 divisions employed by Mr. Praeger (Irish Top. Bot., 1901) and exhibits a curious distribution, being absent from the centre of Ireland as shown by the map given by Praeger in Proc. Roy. Irish Acad., xxiv, B. (1902), p. 38. The plant is included among those which show a "Marginal Type" of distribution in Ireland. The species occurs at Dunkirk in France about 51° N., its most northern locality in Europe, except the British Isles, where it extends north to Orkney, occurring at 58° 58′ N. lat.

I do not find that the hibernacula in this genus are often referred to. Hopkirk in Flora Glottiana (1813), p. 10, mentions the little green balls, and they are mentioned by Withering, British Plants, ed. 7, ii, p. 23 (1830). I have examples on fruiting plants of *P. lusitanica* from near Loch Naver, W. Sutherland (E. S. Marshall, 2, ix, 1887), and on the same species from Ophir, Mainland, Orkney (W. A. Fortescue, September 1911), and on *P. vulgaris* from Islay (A. Somerville). In Leighton's Flora of Shropshire (1841), p. 11, he remarks: "On the gradual decay of the leaves in autumn, small, round, leafy buds or hybernacula are formed, which survive the winter and are capable of developing new plants in the spring."

Formania: a new Genus of the Compositae from Yunnan. By Professor Wright Smith, M.A., and Professor James Small, D.Sc. (With Pl. II.)

(Read 13th January 1922.)

Formania, W. W. Sm. et J. Small. Genus nov. Compositarum.

Genus Anthemidearum; prope Chrysanthemum allocatum; paleis pappi longis linearibus ad *Cancriniam* propinquat atque aliquatenus haud procul ab *Allardia*; a generibus illis habitu erecto fruticoso recedit et receptaculo fimbrillifero differt; a *Chrysanthemo* pappo anomalo et antheris acutis sagittatis divergit.

Fruticulus ad 1 m. altus erectus ramosus. Rami graciles cortice cinerascente induti, juniores puberuli. Folia alterna nunc ad ramulos breves approximata in petiolum brevem latiusculum saepe vix discretum angustata, 1–1·5 cm. longa, 5–10 mm. lata, ambitu obovata, textura crasse papyracea, ad medium vel ultro pinnato-incisa, lobis 5–9 triangularibus vel nunc subquadratis saepe ipsis incisulis lobulis apiculatis, utrinque glabra. Capitula 3–12, heterogama, corymbiter disposita, ramos terminantia, cylindrica, circ. 7 mm. longa, pedunculis puberulis ultimis 1–10 mm. longis nudis vel foliis multo reductis instructis. Involucri phylla pluriseriata exteriora breviora, interiora longiora, ad 5 mm. longa, circ. 1–1·5 mm. lata, oblonga vel lineari-oblonga, obtusa vel subobtusa, scariosa, medio pallido-viridia, supra albo-ciliolata. Receptaculum planum fimbrilliferum. Flores ligulati ♀, circ. 10 pallido-flavi; pars tubulosa circ. 3 mm. longa; ligulae 3 mm. longae; rami stylares latiusculi apice rotundati v. sub-truncati; achaenia 2 mm. longa; pappi paleae quinque lineares 3 mm. longae brevioribus 10–12 additis; flores disci ☿ circ. 8, cum achaenio puberulo circ. 1·1 cm. longi; antherae basi auriculis brevibus acutis sagittatae; styli truncati. Fructus maturi desunt.

Genus monotypicum chinense provinciae yunnanensis incola.

Formania mekongensis, W. W. Sm. et J. Small. Gen. et sp. nov.

"West China:—Bei Ma Shan, Mekong-Yangtze divide, Yunnan, in open situations amongst scrub. Lat. 28° 20′ N. Alt. 10,000 ft. Aromatic shrub of 2–3 feet. Flowers pale yellow. August 1914." G. Forrest. No. 13,183.

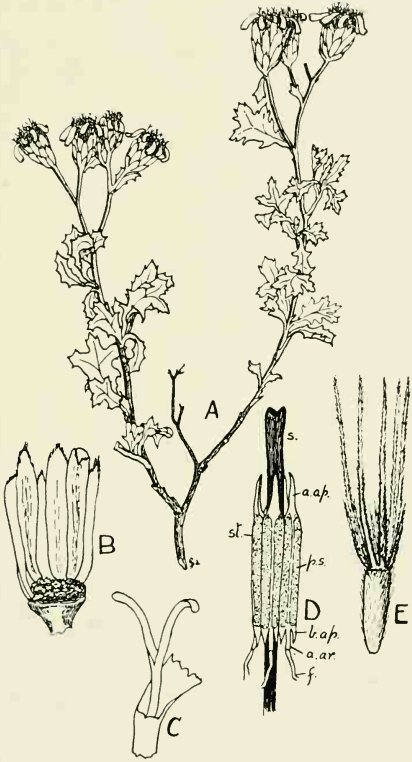
This interesting plant is one of the many new types discovered in Yunnan by Mr. G. Forrest. The fimbrillate receptacle is of interest in connection with the occasional development of quite distinct receptacular paleae in the allied genus, *Chrysanthemum.* In the latter, part of the edge or "fimbrilla" sometimes grows out to form a bract-like structure, in spite of the fact that the absence of receptacular scales is the one diagnostic character of the *Chrysanthemidinae.* The development of the five long paleae of the pappus, very distinctive in *Formania,* might be considered to have occurred in the same way, from some of the numerous short scales which occur on the top of the achenes in some species of *Chrysanthemum.* The presence of well-developed basal appendages to the anthers would even then remain as a floral character separating *Formania* from *Chrysanthemum* and *Cancrina* in which such appendages are absent, and also from *Allardia* where the auricles are connate, not free as in *Formania.*

The generic name which has been attached to the new genus is in honour of the Rev. Adam Forman, O.B.E., one of the chief organisers in Scotland of the supply of *Sphagnum* in the form of surgical dressings during the years 1915–1919.

EXPLANATION OF PLATE II.

Formania mekongensis, W. W. Sm. and J. Small.

A. Portion of flowering branch (nat. size).
B. Fimbrillate receptacle with a few involucral bracts attached.
C. Portion of ligulate floret showing bifid style.
D. Dissection of style, *s.*, and stamens, *st.*, of disc floret, showing truncate style and parts of stamens as follows:—*a. ap.*, apical appendage; *p. s.*, pollen sac; *b. ap.*, basal appendage; *a. ar.*, article anthérifère; *f.*, filament.
E. Achene of disc floret showing ciliate paleaceous awns or scales of pappus.



Formania mekongensis, W. W. Sm. et J. Small.

W. W. Smith and James Small.

PARASENECIO: A NEW GENUS OF THE COMPOSITAE FROM CHINA. By Professor WRIGHT SMITH, M.A., and Professor JAMES SMALL, D.Sc. (With Pl. III.)

(Read 22nd January 1920.)

Parasenecio, W. W. Sm. et J. Small. Genus nov. Compositarum.

Genus *Senecioidearum*; *Senecioni*, Linn. affine a quo appendicibus antherarum magnis obtusis, ramis stylorum penicillis longis ad apicem praeditis, corollae colore, phyllis involucri paucis sub anthesi apice plus minusve cohaerentibus differt, habitum specierum *Ainsliaeae*, DC. nonnullarum simulat.

Herba perennis; rhizoma gracile lignosum strigosum. Caules solitarii erecti herbacei circ. 10-costati apice pubescentes, basi dense pilosi, paniculas laxas pauciramosas gerentes. Folium radicale solitarium magnum cordatum petiolatum marmoratum tenuiter membranaceum, margine ciliatum, crenaturis apiculatis notatum, supra pilis longis adspersum, infra ad nervos nervulosque prominentes dense vestitum; folia caulina plerumque solitaria, raro duo, radicali multoties minora, ceteroquin subsimilia. Capitula mediocria homogama campanulata nutantia floribus 10–15. Involucri phylla 6–8 subbiseriata, interiora 3–4 latiora, exteriora 3–4 angustiora, omnia sub anthesi apice cohaerentia, tandem soluta, lanceolata vel lineari-lanceolata, pilis brevibus adspersa. Receptaculum parvum foveolatum. Corolla pallide rosea fere alba, regularis, tubuloso-campanulata, alte 5-loba. Antherae basi appendiculatae, auriculis magnis obtusis mucronatis. Styli bifidi illos *Senecionis* simulantes sed ad apicum latera longius penicillata. Achaenia 5 mm. longa teretia 5-costata glabra. Pappi setae numerosae albidae molliter scabridae.

Genus monotypicum montium provinciae chinensis Szechwan incola.

Parasenecio Forrestii, W. W. Sm. et J. Small. Gen. et sp. nov.

"West China: Mu-li mountains, S.W. Szechwan, in open, dry sandy pasture. Lat. 28° 12′ N. Alt. 12,000 feet.

Plant of 18–20 inches. Flowers nodding, pale rose, almost white. August 1918." G. Forrest. No. 16,788.

Also in fruit, October 1918. G. Forrest. No. 17,074.

This interesting plant, with its large marbled leaf and pendulous capitula, is an attractive species of a Gesneroid appearance (Pl. III. fig. 1). Although quite unlike in general appearance, *Parasenecio* shows several affinities with the species of *Cremanthodium* of the neighbouring regions, particularly in the large size of the radical leaf and the long, erect flower-stalk with nodding capitula. It approaches some species of the *Ligularia* section of *Senecio* in general habit, but the single radical leaf and many of the characters of the capitulum and florets are quite distinct. Apart from the colour of the corolla all the characters of the plant, except the well-developed obtuse tails of the anthers, would allow of its being placed in the genus *Senecio*. In the section *Synotis* of the Himalayan species of *Senecio* basal appendages to the anthers occur, but these are quite different in size and shape. The long apical hairs of the style-branches and the peculiar adhesion of the tips of all the young involucral leaves combine, however, to make it an unique species, which would be unique even if included in *Senecio*. It is, therefore, deemed more advisable to make a new genus of the plant and thus draw attention to its striking peculiarities rather than to include it amongst the 2500 species of *Senecio* where it would require a position of sectional or sub-generic rank. The generic name given to the plant indicates this point of view and also the affinities of the genus.

The plant is a perennial herb with a thin woody rhizome (fig. 1, A) which throws up one large radical leaf. This solitary leaf (fig. 1, B) has rather an ornamental appearance (in the figure the lower surface is shown); it is cordate, about 6 inches in diameter, very thin, and marbled with pale green in the spaces between the veins (*cf.* fig. 1, C); the margin is ciliate and crenate, the crenations and most furrows being marked by one or more small denticulations. The denticulation at the apex of each crenation is dark purple in colour and seems from an examination of the dried leaf to be a typical hydathode at the end of the vein,

such as occurs in *S. lagopus*, Raoul and *S. saxifragoides*, Hook. f., of New Zealand.[1] The upper surface is sparsely covered with unusually large simple hairs, somewhat similar to the silky hairs of *S. lagopus*. On the lower surface these hairs are aggregated along the main veins and, assuming a brown colour, are very like bryophytic rhizoids. The petiole, which is 1½ to 2 inches long, is also densely covered with these large brown hairs. The ridged flowering stem about 18 or 20 inches high arises later in the season from the axil of the radical leaf. Usually one small leaf, rarely two, very similar, except in the absence of crenations, to the radical leaf occurs about 3 inches from the base of the flowering stems (fig. 1, C); no other foliage leaves are present. About a foot above the cauline leaf the stem branches into a loose, very slightly branched raceme. The capitulum is bracteate, shortly pedicellate and droops (fig. 2). It is pear-shaped when young on account of the cohesion of the involucral leaves, which continues as far as is at present known until the beginning of the anthesis. Fruiting capitula (fig. 3) are campanulate and have the involucral leaves free. These leaves separate from the base upwards but remain attached at the tips until anthesis begins (fig. 2). The involucral bracts are six or eight in number, the three or four linear-lanceolate leaves overlapping at their edges the three or four inner, broader, lanceolate leaves. There are thus two series, an inner and an outer of involucral leaves, but since all six or eight are required to complete the circle around the florets, the involucre is described as sub-biseriate. The bracts are sparsely covered with short hairs, but the outside of the receptacle and the pedicel immediately below are densely hairy. The receptacle is small, flat, and foveolate. Ray florets are absent; all the 10–15 florets are hermaphrodite, regular and tubular campanulate (fig. 4.). The style (fig. 5) is branched; the style branches are flattened with truncate, penicillate tips; the apical hairs at the sides of the tips are much longer than is usual in *Senecio*. The stamens have the typical apical appendages (fig. 6), and very distinct, obtuse,

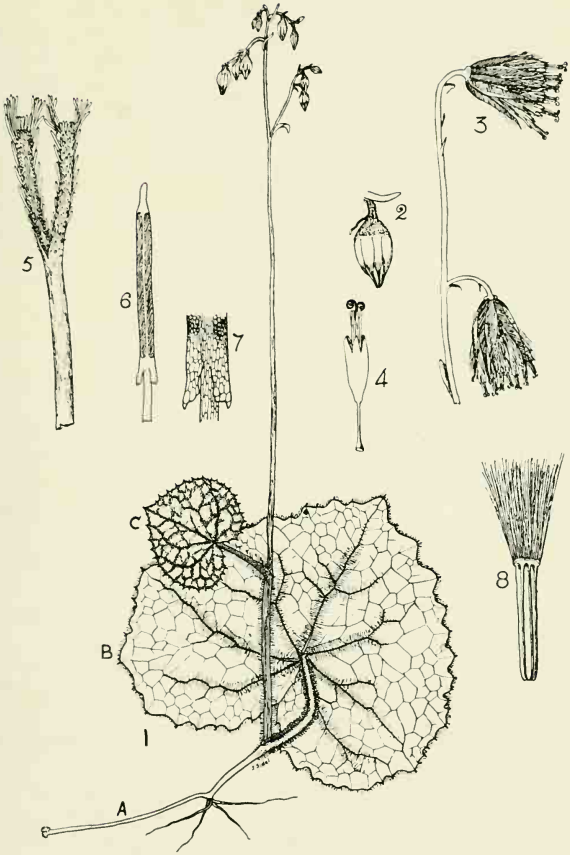
[1] Wall, A.: On the Distribution of *Senecio saxifragoides*, Hook. f. Trans. N. Z. Instit., Vol. l, p. 201, 1917.

mucronate, basal appendages (fig. 7), which are quite unlike the inconspicuous, small, acute appendages of some Himalayan species of *Senecio*, e.g. *S. Candolleanus*, Wall., and *S. chenopodifolius*, DC. The corolla is tubular-campanulate, regularly and deeply 5-lobed (fig. 4); pale rose almost white in colour (*fide* Forrest), drying to a dark brown. The achenes (fig. 8) are terete and glabrous with five prominent ridges. The setae of the pappus are numerous white, soft, and scabrid.

Apart from its interest as a new type of *Compositae*, *Parasenecio* is interesting on account of its bearing upon the evolution of the family. Whereas *Cavea*[1] was suggested to be an ancient type and possibly a remote ancestor of the Cynareae, this new genus seems to be one of the most recent developments from the *Senecio* plexus. The single, large, radical leaf suggest a comparison with *Tussilago* and *Petasites*; the geophilous method of projecting the inflorescence first which obtains in these two genera may be regarded as a secondary adaptation to the short summer season characteristic of the more northern habitats of the coltsfoot and butter-bur. The affinities which are shown with *Cremanthodium* and with the *Ligularia* and *Synotis* sections of *Senecio* have already been mentioned, and in these more immediate neighbours of the new genus we do not find the geophilous habit. *Parasenecio*, therefore, has affinities with the northern, uniphyllous, geophilous type and with the more southern, radical-leaved, scapigerous type. Both these types, according to the views of one of us,[2] were derived from *Senecio* by the response made to various environmental factors. It is noteworthy, therefore, that the elongated appendages of the style branches and the simple stamens which distinguish the *Tussilagininae* and *Ligularia* are absent in *Parasenecio*, which thus approaches the common ancestor of those groups more closely than does any genus of the *Tussilagininae*. *Parasenecio*, in fact, appears as another

[1] Smith, W. W. and Small, J.: *Cavea;* a new Genus of the Compositae from the East Himalaya. Trans. and Proc. Bot. Soc. Edin., Vol. xxvii, p. 123, 1917.

[2] Small, J.: Origin and Development of the Compositae. New Phytologist., Vol. xviii, p. 206, 1919.



Parasenecio Forrestii, W. W. Sm. et J. Small.

W. W. Smith and James Small.

offshoot from *Senecio*, which has arisen in the same region but at a much later date as the expression of tendencies in *Senecio* somewhat similar to those which gave the *Tussilagininae*. The difference in the colour of the corolla may well be due to the anthocyan changes, like those which gave the *red* sunflower, the brilliant hues of *Cremanthodium*, and the more subdued tints of *Petasites*; but the development of the long hairs of the style-branches, the well-developed, obtuse basal appendages of the anthers, and the peculiar cohesion of the young involucral bracts all show that *Parasenecio* as an offshoot from *Senecio* makes altogether a new angle with the parental stem.

EXPLANATION OF PLATE III.

Fig. 1. General habit of *Parasenecio Forrestii* under surface of radical leaf and upper marbled surface of cauline leaf shown.
Fig. 2. Young capitulum showing slit-openings of involucre.
Fig. 3. Fruiting capitula showing mature shape and free involucral leaves.
Fig. 4. Floret of same showing exserted anther-tube and recurved style-branches.
Fig. 5. Style showing long apical hairs.
Fig. 6. Stamen showing apical and basal appendages.
Fig. 7. Lower part of same showing obtuse mucronate basal appendages.
Fig. 8. Ripe achene showing pappus and ridges.

Alchemilla conjuncta, Bab., in Dumfriesshire.

By G. F. Scott Elliot, M.A., B.Sc.

(Read 10th February 1922.)

During the summer of 1921 a specimen of what appeared to be this species was forwarded to me by Mr. Gladstone, Younger, of Capenoch. He and Mr. Scott, Thornhill, had found it growing in a certain glen near Penpont at a considerable distance from any cottage.

The name *A. conjuncta*, Bab., was confirmed by Mr. W. E. Evans of the Royal Botanic Garden, Edinburgh, who gave me some interesting details of its distribution. Some months afterwards Dr. Semple of the Dumfries Academy

informed me that he and Mr. M'Cutcheon had gathered the same plant in the same locality in 1902 and transferred specimens to their gardens where it grows like a weed. He also said that it was believed in the district that the late Dr. Grierson of Thornhill had planted this and other rare alpines in the neighbouring glens.

This suggestion may or may not be correct, but the plant has apparently maintained itself for some twenty years in this particular locality. Considering that the Rev. Dr. Singer recorded *A. alpina*, L., for the county in 1843, it is perhaps advisable, in order to prevent controversy in the centuries to come, that these facts should be placed before the Society.

ADDITIONS TO THE FLORA OF ORKNEY, AS RECORDED IN WATSON'S "TOPOGRAPHICAL BOTANY," Second Edition (1883). By Colonel H. H. JOHNSTON, C.B., C.B.E., D.Sc., F.R.S.E., F.L.S.

(Read 20th April 1922.)

This paper forms a continuation of four papers on the same subject, one of which I read before the Scottish Natural History Society on 4th April 1895, and which was published in "The Annals of Scottish Natural History," No. 15, pp. 173–181 (July 1895), and the other three before the Botanical Society of Edinburgh on 15th January 1914, 10th June 1920, and 17th March 1921, and which were published in the Society's "Transactions," vol. xxvi, pp. 207–217 (1914), and vol. xxviii, pp. 23–42 (1920), and pp. 51–66 (1921), respectively. Most of the plants mentioned in this paper were collected by me during the year 1921.

Before and after the publication of the second edition of Watson's "Topographical Botany," in 1883, several of the plants mentioned in the following list have been recorded from Orkney by me and other botanists; but as the value of botanical records is greatly enhanced by the possession of authentic specimens, I have included in this list the names of all specimens in my herbarium, which are either additional to or confirm doubtful records of the plants

recorded from County No. 111 Orkney in the second edition of the above-mentioned book.

In the case of those plants which have already been recorded from Orkney, references are given in the following list, under each species and variety, to the books in which the records have been published. These records are principally contained in "A Tour through some of the Islands of Orkney and Shetland," in the year 1804, by Patrick Neill (1806); "Notice of some of the rarer Plants observed in Orkney during the Summer of 1849," by John T. Syme, Esq., published in the "Transactions of the Botanical Society of Edinburgh," vol. iv, pp. 47–50 (1850); "Florula Orcadensis—A list of plants reported to occur in the Orkney Isles," by H. C. Watson, Esq., F.L.S., published in the "Journal of Botany," No. xiii, pp. 11–20 (January 1864); Annual Reports of the Botanical Exchange Club of the British Isles; "A new List of the Flowering Plants and Ferns of Orkney," edited by W. A. Irvine Fortescue, and published in "The Scottish Naturalist" (1882–1884); "Supplement to Topographical Botany, ed. ii," by Arthur Bennett, A.L.S. (1905); and "Flora Orcadensis," by Magnus Spence, F.E.I.S. (1914).

The nomenclature followed is that of the second edition of Watson's "Topographical Botany" (1883), except in the case of species and varieties which are not recorded in that work. In the latter case the nomenclature adopted is that of "The London Catalogue of British Plants," tenth edition (1908). Non-native plants, which have become naturalised in Orkney, are distinguished by a * prefixed to the names, and the names of casuals are printed in italics.

Of the 42 species, varieties, forms, and hybrids recorded from Orkney in the following list, 29 are native, 1 is naturalised, 10 are mere casuals introduced into Orkney through the agency of cultivation, and 2 were planted by man.

Abbreviations.

"Annals Scot. Nat. Hist." = The Annals of Scottish Natural History.
Bennett, "Suppl. Top. Bot." = Supplement to H. C. Watson's Topographical Botany, second edition. By Arthur Bennett, A.L.S. (1905).

"Bot. Exch. Club Report" (separate Reports by the Secretary and Distributor) = Report of The Botanical Exchange Club of the British Isles, at present called The Botanical Society and Exchange Club of the British Isles.
"Journ. Bot." = The Journal of Botany.
"Lond. Cat." = The London Catalogue of British Plants.
Neill, "Tour" = A Tour through some of the Islands of Orkney and Shetland, in the year 1804. By Patrick Neill, A.M., Secretary to the Natural History Society of Edinburgh (1806).
"Scot. Nat." = The Scottish Naturalist.
Spence, "Flora Orcadensis" = Flora Orcadensis. By Magnus Spence, F.E.I.S. (1914).
Watson, "Top. Bot." = Topographical Botany, second edition. By H. C. Watson (1883).

CORRECTIONS.

In "Trans. Bot. Soc. Edin.," vol. xxviii, p. 27 (1920), *for* "SAGINA APETALA, Ard. (*fide* Arthur Bennett)," *read* SAGINA PROCUMBENS, Linn. (*fide* C. E. Salmon and Arthur Bennett), and *delete* "confirms the record of this species for H. C. Watson's County No. 111 Orkney by Mr. Patrick Neill in his 'Tour,' p. 185 (1806)."

In "Trans. Bot. Soc. Edin.," vol. xxviii, p. 58 (1921), after *Rhinanthus major*, Ehrh." *delete* "(name confirmed by Arthur Bennett)," and *substitute* var. c. *apterus*, Fries (*fide* C. E. Salmon).

In "Trans. Bot. Soc. Edin.," vol. xxvii, p. 57 (1916), in line 13 from top of page, *for* "Syme sp. 1888" *read* Boswell sp. 1880; and in line 20 from top of page, *for* "1852" *read* 1882.

CLASS I.—DICOTYLEDONS.

Aquilegia vulgaris, Linn.—Roadside at farm steading, 100 feet above sea-level, Binscarth, Firth, Mainland, 2nd June 1921, Henry Halcro Johnston. Not native. Escape from a garden. Very rare. Plants beginning to flower. Petals purple.

The aggregate species *Viola tricolor*, Linn., is recorded from Orkney in Watson, "Topographical Botany," ed. ii, p. 57 (1883), but the following five species are not mentioned in that book. The nomenclature followed for these species is that of "The British Pansies," by Eric Drabble, D.Sc., F.L.S., reprinted from "The Journal of Botany" (1909):—

GROUP I.—ARVENSES.

Viola segetalis, Jordan, "Observations," ii, p. 12, t. 1B. (*fide* Arthur Bennett and W. G. Travis).—The same specimens were identified as "*Viola arvensis*, Murr.," by the late Dr. J. T. I. B. Boswell. Corn-field, Hurkisgarth, Sandwick, Mainland, 4th August 1886, H. H. Johnston. Not native. A weed of cultivation. Plants in full flower. See "Bot. Exch. Club Report for 1886," p. 145 (1887); "Scot. Nat.," No. xxv, new series, p. 112 (July 1889); "Bot. Exch. Club Report for 1900," p. 623 (1901); "Annals Scot. Nat. Hist." No. 15, p. 175 (July 1895); Bennett, "Suppl Top. Bot." p. 15 (1905); and Spence, "Flora Orcadensis," p. 8 (1914).

GROUP II.—TRICOLORES.

Viola Lloydii, Jordan in Boreau, "Fl. du Centre," ed. 3, ii, p. 80 (*fide* W. G. Travis).—Corn-field, Hangaback, Gyre, Orphir, Mainland, 7th August 1874, H. H. Johnston (the same specimen was identified as "*Viola tricolor*, Linn.," by the late Dr. J. T. I. B. Boswell); shell-sandy hay-field, 20 feet above sea-level, Quoyerland, Lady, Sanday, 17th May 1921, H. H. Johnston; gravelly burnside, 130 feet above sea-level, Burn of Vacquoy, Rousay, 20th July 1921, H. H. Johnston; plants growing among *Ulex europaeus, *Linn.*, at the side of a road between an oat-field and a grass-field, 190 feet above sea-level, Sunnybrae, Saint Ola, Mainland, 16th August 1921, H. H. Johnston; and oat-field, 40 feet above sea-level, Quoys, South Ronaldsay, 6th September 1921, H. H. Johnston. Not native. A weed of cultivation, confined in Orkney to cultivated land, where it is common, and to the borders of cultivated land, as at the Burn of Vacquoy in Rousay and Sunnybrae in Mainland, where it is rare. Plants in full flower at all the above-mentioned five stations, and at Sunnybrae some plants were sparingly in fruit on 18th September 1921. The following notes were made by me from living plants, at Sunnybrae in Mainland, on 16th August 1921:—Flowers inodorous. Two upper petals uniformly violet, with faint dark violet veins; two lateral petals purplish-blue, with 3–4 dark violet veins; lower petal purplish-blue, with 7

dark violet veins, and a yellow base; spur of lower petal longer than the calycine appendages, dull purple. Anther-spurs filiform, with subclavate extremities. Stigma pale greenish-yellow. The colour of the flowers at the other four stations was the same as that of those at Sunnybrae, and at all the stations the *yellow* colour of the corolla was confined to the *base* of the *lower petal*.

Viola variata, Jordan, "Pugillus," p. 26 (*fide* W. G. Travis).—Corn-field, Hurkisgarth, Sandwick, Mainland, 4th August 1886, H. H. Johnston (the same specimen was identified as "*Viola tricolor*, Linn.," by the late Dr. J. T. I. B. Boswell); and plants growing among *Viola Lloydii*, Jordan, and *Ulex europaeus, *Linn.*, at the side of a road between an oat-field and a grass-field, 190 feet above sea-level, Sunnybrae, Saint Ola, Mainland, 16th August 1921, H. H. Johnston. Not native. A weed of cultivation. Rare at Sunnybrae. Plants in full flower at both stations. The colour of the flowers is similar to that of *Viola Lloydii*, Jordan, growing at the same station. See "Bot. Exch. Club Report for 1886," p. 145 (1887).

GROUP III.—SAXATILES.

Viola lepida, Jordan, "Pugillus," p. 28 (*fide* W. G. Travis).—Marshy hillside, 460 feet above sea-level, Hill of Miffia, Stromness, Mainland, 18th June 1920, H. H. Johnston. Not native. One plant only seen by me growing on the marshy hillside, within quarter of a mile of the highest cultivated land in Orkney, which on the Hill of Miffia reaches an elevation of 500 feet above sea-level. Plant in flower.

GROUP V.—CURTISIEAE.

VIOLA PESNEAUI, *E. G. Baker* in "Journ. Bot.," vol. xxxix, p. 9 (1901) (*fide* W. G. Travis).—Plants growing among PSAMMA ARENARIA, *R. et S.*, and mosses, in shell-sandy links near the seashore, 10–15 feet above sea-level, Sty Wick, Lady, Sanday, 29th May 1920 and 17th May 1921, H. H. Johnston; plants growing among PSAMMA ARENARIA, *R. et S.*, in shell-sandy links near the seashore, 15 feet above sea-level, Quoy Ness, Cross, Sanday, 25th August 1920, H. H. Johnston; and plants growing among PSAMMA

ARENARIA, *R. et S.*, in shell-sandy links near the seashore, 10 feet above sea-level, Backaskaill Bay, Cross, Sanday, 16th May 1921, H. H. Johnston. Native, common, and plants in full flower at all these three stations. A new record for this species for H. C. Watson's county No. 111 Orkney. The following notes were made by me from living plants at Sty Wick, on 17th May 1921:—Subterranean perennating stems many, wiry, branched, turning upwards and bearing foliage-leaves, and flowers. Two upper petals uniformly violet; two lateral petals purplish-blue, with dark violet lines; lower petal purplish-blue, with dark violet lines, and a yellow base. Anther-spurs long, filiform. The colour of the flowers at Quoy Ness and Backaskaill Bay was the same as that of those at Sty Wick. This pretty-flowered and truly native species is an interesting addition to the flora of Orkney.

Silene inflata, Sm. [=*Silene cucubalus*, Wibel, and *Silene latifolia*, Rendle et Britten] (*fide* Arthur Bennett).—Grassy border of an oat-field, 130 feet above sea-level, Kierfiold, Sandwick, Mainland, 6th August 1921, H. H. Johnston. Not native. A weed of cultivation. Common. Plants in full flower. Calyx inflated, dull purplish-green. Petals white. Styles 3, white. Plants in ripe fruit on 4th October 1921. Removes "[111]" from among the "supposed errors" in Watson, "Top. Bot.," ed. ii, p. 64 (1883). In the Rev. Dr. Barry's "History of the Orkney Islands," ed. ii, p. 281 (1808), "CUCUBALUS, *Behen*" [=the old name of *Silene inflata*, Sm.] is mentioned, but the Rev. George Low and Rev. Dr. Barry have confounded SILENE MARITIMA, *With.*, with this species, as is explained by Mr. Patrick Neill in his "Tour," p. 186, footnote ‖ (1806), under "Silene maritima ‖." See "Journ. Bot.," No. xiii, p. 13 (January 1864), where the "?" should be removed from "Silene inflata?" and *ibid.*, p. 18, where Mr. H. C. Watson states, "I can only guess here that *S. nutans* of Low intended the typical *S. inflata*, apart from *S. maritima*." In the Rev. Dr. Barry's "History of the Orkney Islands," ed. ii, p. 281 (1808), the following record occurs:—"SILENE *Nutans*. Nottingham catch-fly. In a meadow of Binaskart." Confirms the record of this species from Orkney ("near Lynn, Kirkwall"), by Dr. A. R. Duguid in

his manuscript "Flora Orcadensis" (1858). Removes the "(?)" from "111(?)" under Silene Cucubalus, *Wibel*, in "Annals Scot. Nat. Hist.," No. 26, p. 100 (April 1898). See "Annals Scot. Nat. Hist.," No. 56, p. 229 (October 1905); and Spence, "Flora Orcadensis," p. 9 (1914), where the plant "Found on farm of Keigar, Deerness, in 1904; introduced with seeds," is *Silene dichotoma*, Ehrh. (*fide* Arthur Bennett), which has been confounded with *Silene cucubalus*, Wibel, by the late Mr. Magnus Spence.

SAGINA NODOSA, *Fenzl., var. b.* GLANDULOSA (*Bess.*) (*fide* C. E. Salmon).—Meadow at Scapa, Saint Ola, Mainland, 25th July 1876, H. H. Johnston; damp loch-shore, Groundwater, Loch of Kirbister, Orphir, Mainland, 9th August 1878, H. H. Johnston; marsh, 20 feet above sea-level, Loch of Saintear, Westray, 23rd August 1913, H. H. Johnston; marshy burnside, 20 feet above sea-level, Selwick, Hoy, 8th September 1914, H. H. Johnston; and marsh, 60 feet above sea-level, Graemston, South Ronaldsay, 6th September 1921, H. H. Johnston. Native, rare, and plants in flower at all these five stations. Petals white, entire. This variety is more common in Orkney than the type of the species, of which latter I have specimens only from North Ronaldsay, collected by me on 20th and 23rd August 1920, and even in these specimens a few glands are present. Confirms the record for this variety from Orkney in Spence, "Flora Orcadensis," p. 12 (1914).

ROSA OMISSA, *Déségl., var. b.* RESINOSOIDES, *Crépin.* (*fide* William Barclay).—Grassy banks at burnside, 100 feet above sea-level, Trumland Burn, Rousay, 25th August 1921, H. H. Johnston (plants in unripe fruit); and 7th November 1921, John Logie (plants in ripe fruit). Native. Rare. With reference to my specimens, Mr. William Barclay, in a note dated 6th March 1922, writes as follows:—"The variety is hardly separable from the type except by its longer peduncles." A new record for this variety for H. C. Watson's county No. 111 Orkney. This plant is probably the same as the "Rosa villosa, Apple-rose, Trumbland, Rousay," recorded by Mr. Patrick Neill in his "Tour," p. 187 (1806); in Dr. A. R. Duguid's manuscript "Flora Orcadensis" (1858); and in "Journ. Bot.," No. xiii, p. 14 (1864).

ROSA GLAUCA, *Vill., var. c.* SUBCANINA, *Christ.* (*fide* William Barclay).—Grassy banks at burnside, 250 feet above sea-level, Upper Dowscarth, Russa Dale, Stenness, Mainland, 27th September 1921 (plants in unripe fruit), and 11th November 1921 (plants in ripe fruit), H. H. Johnston. Native. Rare. A new record for this variety for H. C. Watson's county No. 111 Orkney.

[*Valeriana pyrenaica*, Linn.—Plantation of trees, 80 feet above sea-level, Binscarth, Firth, Mainland, 2nd June 1921, H. H. Johnston. Not native. Plants introduced into Orkney and planted at Binscarth prior to 1880, since which time the plants have multiplied and spread in the plantation, where they are now common. Plants in flower. —Corolla lilac. This species is recorded from Orkney in "Annals Scot. Nat. Hist.," No. 27, p. 173 (July 1898); and in Spence, "Flora Orcadensis," p. 33 (1914); but having been planted in an artificial plantation of trees, and being still confined to that plantation, it has no claim to be included in the flora of Orkney, any more than the exotic trees in the same plantation.]

The aggregate species TARAXACUM OFFICINALE, *Wigg.*, is recorded from Orkney in Watson, "Top. Bot.," ed. ii, p. 236 (1883), but the following segregate species are not mentioned in that book:—

TARAXACUM DEVIANS, *Dahlstedt* (*fide* Hugo Dahlstedt).—Natural shell-sandy pasture near the seashore, 15 feet above sea-level, Links of Boardhouse, Birsay, Mainland, 29th April 1921, H. H. Johnston. Native. Common. A new record for this species for H. C. Watson's county No. 111 Orkney. Plants in flower. Outer phyllaries recurved in flower; inner phyllaries simple at the apex (not gibbous or appendaged). Corolla yellow, striped dull purplish beneath. Anthers purplish-yellow. Style and its two branches pale brownish-yellow. Plants in fruit on 6th June 1921. Fruit receptacle flattish-convex. Achenes brown. Dr. Hugo Dahlstedt informs me that this species also grows in the Faeroes.

TARAXACUM UNGUILOBUM, *Dahlstedt* (*fide* Hugo Dahlstedt).—Damp natural pasture near the seashore, 10 feet above sea-level. Isgarth, Lady, Sanday, 29th May 1920, H. H. Johnston. Native. Common. A new record for

this species for H. C. Watson's county No. 111 Orkney. Plants in flower, and a few plants sparingly in fruit. Leaves dull green above, paler green beneath. Outer phyllaries adpressed in flower; inner phyllaries simple at the apex (not gibbous or appendaged). Fruit-receptacle flattish, with a concave centre and convex margin. Achenes brown. Dr. Hugo Dahlstedt informs me that this species also grows in western Norway between Bergen and Hardanger.

TARAXACUM FAEROENSE, *Dahlstedt* (*fide* Hugo Dahlstedt).—Marshy heath, 430 feet above sea-level, Myres, near Muckle Water, Rousay, 18th June 1921, H. H. Johnston. Native. Common. A new record for this species for H. C. Watson's county No. 111 Orkney. Plants in full flower and sparingly in fruit. Dr. Hugo Dahlstedt informs me that this species also grows in Scotland, Faeroes, Iceland, and western Norway.

TARAXACUM.—Shell-sandy links at seashore, 10 feet above sea-level, Bay of Skaill, Sandwick, Mainland, 21st June 1919, H. H. Johnston. Native. Common. Same individual plants in flower and fruit at the same time. Leaves runcinate—pinnatifid, with small lobes between the large lobes; midrib purplish; blade dull green above, paler somewhat glaucous-green beneath. Outer phyllaries recurved or spreading both in flower-bud and in flower, oblong-lanceolate, acuminate; inner phyllaries strap-shaped, gibbous, and appendaged at the apex. Achenes olive-coloured, spinulose—muricated at the apex; beak thickened at the base. With reference to my specimens, Reference No. 457, Dr. Hugo Dahlstedt, in a note dated 12th January 1922, writes as follows:—"This form belongs to Vulgaria [=T. officinale (coll.) olim] and seems to be allied to T. angustisquameum, *Dahlstedt*. But probably it is a new related species." My specimens do not agree with the description of any of the varieties of Taraxacum officinale, *Wiggers*, mentioned in "English Botany," ed. iii, pp. 142 and 143 (1873).

Campanula rotundifolia, Linn.—Grassy border of an oat-field, 200 feet above sea-level, about ¼ mile north of Sunnybank House, Saint Ola, Mainland, 16th August 1921, H. H. Johnston. Not native. One small clump of

plants only seen by me. Plants in flower and unripe fruit. Corolla blue.—Stigma 3-cleft, pale yellow.

* Mimulus luteus, *Linn.* (*fide* Arthur Bennett and W. B. Turrill).—Marshy shell-sandy burnside at the seashore, 5 feet above sea-level, Sandside Bay, Deerness, Mainland, 21st June 1921, H. H. Johnston. Naturalised. Common in the burn between Netherstove, 120 feet above sea-level, and the seashore. Plants of this species were thrown out of the garden at Netherstove into the burn by Miss Elizabeth Ritch about 1911, since which time they have become thoroughly naturalised in the burn below the garden, in which also they still continue to grow under cultivation. Plants in full flower. Corolla yellow, with dark maroon blotches on the lobes of the limb (hence the name "Blood-drop" given to this garden plant in Orkney). Mr. W. B. Turrill, in a note dated 24th February 1922, writes as follows:—"Mimulus luteus, *Linn.*, *i.e.* the S. American plant. M. Langsdorfii, *Donn.*, differs in the inflorescence and in the shape of the corolla. Numerous colour forms are cultivated."

Euphrasia stricta, *Host.* (*fide* Cedric Bucknall and Dennis Lumb).—Natural pasture, 170 feet above sea-level, Holland, South Ronaldsay, 6th September 1921, H. H. Johnston. Native. Common. Plants in full flower, and sparingly in fruit. Leaves 2–10 toothed. Corolla large, with a pale lilac upper lip, and white lower lip marked with a yellow spot on the throat, and with dark purple lines on both lips. A new record for this species for H. C. Watson's county No. 111 Orkney.

Euphrasia minima, *Jacq.* (*fide* Cedric Bucknall and Dennis Lumb).—Moist heath, 170 feet above sea-level, Gairy Hill, South Ronaldsay, 1st September 1921, H. H. Johnston. Native. Common. Plants in full flower. Leaves 2–6 toothed. Corolla small, with a light purple upper lip, and white lower lip marked with a yellow spot on the throat, and with dark purple lines on both lips. A new record for this species for H. C. Watson's county No. 111 Orkney.

Rhinanthus stenophyllus, *Schur.* (*fide* C. E. Salmon).—Scapa, Saint Ola, Mainland, 25th July 1876, H. H. Johnston; Hoy, 9th July 1877, H. H. Johnston; grassy

and heathery banks at loch-side, 5 feet above sea-level, Seatter, Loch of Stenness, Stromness, Mainland, 15th August 1919, H. H. Johnston; artificial pasture, 20 feet above sea-level, Point of Onston, near the Bridge of Waith, Stenness, Mainland, 3rd August 1920, H. H. Johnston; grassy and heathery pasture, 10 feet above sea-level, Point of Onston, Stenness, Mainland, 9th August 1920, H. H. Johnston; natural grassy and heathery pasture, 30 feet above sea-level, Deepdale, Stromness, Mainland, 14th August 1920, H. H. Johnston; and natural heathery and grassy pasture, 40 feet above sea-level, Purtabreck, North Ronaldsay, 20th August 1920, H. H. Johnston Native and common at all these stations. The flowering season of this species in Orkney lasts from June to August, the earliest and latest dates of flowering observed by me being 6th June 1921 and 15th August 1919, respectively. The flowers are in greatest profusion during July, while in August the plants are mostly in ripe fruit Mr. C. E. Salmon is of opinion that my specimens from Seatter, Point of Onston, and Deepdale, are only "small examples of R. STENOPHYLLUS, *Schur.*," and he has not identified any of them as R. RUSTICULUS, *Sterneck*, although my specimens from the Point of Onston and Deepdale were collected at the same stations as the plants referred to by Dr. G. Claridge Druce in "Bot. Exch. Club Secretary's Report for 1920," p. 140 (September 1921). The stem of my smallest specimen from Deepdale is only 4 cm. ($1\frac{1}{2}$ inch) long, and the leaves are 3–5 mm. long and 1 mm. broad. RHINANTHUS STENOPHYLLUS, *Schur.*, is more common in Orkney than R. CRISTA-GALLI, *Linn.* [=R. MINOR, *Ehrh.*] (*fide* C. E. Salmon), of which I have specimens only from grassy cliffs at the seashore, 40 feet above sea-level, collected by me at Scapa, Saint Ola, Mainland, on 5th July 1912. This latter species is also native, and it was in flower and unripe fruit on 5th July 1912, with green bracts, and a yellow corolla, with the two lateral lobes of the upper lip small, short, roundish, and dark purple in colour. See "Journ. Bot.," vol. xxxix, p. 270 (August 1901), and vol. xli, p. 295 (1903); "Bot. Exch. Club Report for 1903," p. 7 (April 1904); and "Trans. Bot. Soc. Edin.," vol. xxvii, p. 56 (1916).

Lamium album, Linn.—Artificial pasture, 20 feet above sea-level, farm-steading of the glebe of the Established Church Manse, Holm, Mainland, 12th May 1921 (plants not in flower or fruit), and 22nd June 1921 (plants in full flower), H. H. Johnston. Not native. Rare. Corolla pale yellowish-white. Confirms the record of this species from Orkney in the Rev. Dr. Barry's "History of the Orkney Islands," ed. ii, p. 283 (1808). See "Journ. Bot," No. xiii, p. 15 (January 1864); "Scot. Nat.," No. xlviii, p. 373 (October 1882); Watson, "Top. Bot.," ed. ii, p. 314 (1883); "Annals Scot. Nat. Hist.," No. 30, p. 100 (April 1899); and Spence, "Flora Orcadensis," p. 56 (1914).

Myosotis collina, Hoffm. (*fide* Arthur Bennett).—Turf top of stone wall and grassy floor of old Monastery in ruins, 30 feet above sea-level, Eynhallow, 24th August 1921, H. H. Johnston. Not native. Common at the Monastery. Plants in full flower and sparingly in fruit. Stem clothed with straight spreading hairs. Calyx clothed with spreading hairs, hooked at the apex. Corolla small, with a blue limb and yellow throat. Confirms the record of this species from Orkney by the late Mr. Magnus Spence in his "Flora Orcadensis," p. 58 (1914).

Lysimachia punctata, Linn. (*fide* Arthur Bennett).—Grassy bank at side of a mill pond, 80 feet above sea-level, Gyre, Orphir, Mainland, 28th July 1921, H. H. Johnston. Not native. Escape from a garden. Rare. Plants in full flower. Confirms Dr. G. Claridge Druce's record of this species from Orkney ("near Stenness") in "Bot. Exch. Club Secretary's Report for 1920," p. 135 (September 1921). I first saw this plant growing wild in Orkney, at a burnside, at Newhouse, Clestrain, Orphir, Mainland, on 21st August 1914, on which date Mr. Peter Goudie informed me that, several years previously, plants of this species had been transplanted from his garden at Newhouse to the burnside, where they have continued to grow, multiply, and spread.

ATRIPLEX GLABRIUSCULA, *Edmondston, var. b.* VIRESCENS, *Moss et Wilmott* in "The Cambridge British Flora," vol. ii, p. 178 (1914) (*fide* A. J. Wilmott). [=ATRIPLEX BABINGTONII, *Woods, var. b.* VIRESCENS, *Lange*, "Haanb. Danske Fl.," p. 712 (1864); and "Lond. Cat.," ed. x (1908); but *not* ATRIPLEX GLABRIUSCULA, *Edmondston, var. a.* BABINGTONI,

Moss et Wilmott in "Camb. Brit. Flora," vol. ii, p. 178, plate 182 (1914)].—Shingly seashore, Scapa, Saint Ola, Mainland, 25th July 1876, H. H. Johnston; stony ground near edge of sea-cliffs, Ramna Geo, Sandwick, Mainland, 23rd July 1886, H. H. Johnston (my specimens from these two stations were identified as "ATRIPLEX BABINGTONII, *Woods*," by the late Dr. J. T. I. B. Boswell); shell-sandy and shingly seashore, 5 feet above sea-level, Backaskaill Bay, Cross, Sanday, 25th August 1920 and 8th and 9th October 1921, H. H. Johnston; rocky seashore, 20 feet above sea-level, Eynhallow, 24th August 1921, H. H. Johnston; shell-sandy seashore, 5 feet above sea-level, Saviskaill, Rousay, 25th August 1921, H. H. Johnston, and 5th October 1921, Mark McKay Kirkness; site of a former heap of seaweed on pasture at seashore, 10 feet above sea-level, Langskaill, Rousay, 25th August 1921, H. H. Johnston, and 22nd October 1921, Mark McKay Kirkness; shingle at seashore, 5 feet above sea-level, Muckle Skerry, Pentland Skerries, 5th September 1921, H. H. Johnston; and shingle at seashore, 5 feet above sea-level, Wind Wick, South Ronaldsay, 7th September 1921, H. H. Johnston. Native, and common at all these eight stations, except Eynhallow and Muckle Skerry, where this variety is rare.

Note.—The *var. b.* VIRESCENS, *Moss et Wilmott*, is the common seashore ATRIPLEX in Orkney, and it is the plant that has been recorded under the name of "ATRIPLEX BABINGTONII, *Woods*," in "Journ. Bot.," No. xiii, p. 16 (January 1864); Watson, "Top. Bot.," ed. ii, p 348 (1883); "Scot. Nat.," No. i, new series, p. 21 (July 1883); "Annals Scot. Nat. Hist.," No. 30, p. 101 (April 1899); and Spence, "Flora Orcadensis," p. 61 (1914).

I have not found the *var. a.* BABINGTONI, *Moss et Wilmott*, in Orkney.

[*Rheum Rhaponticum*, Linn.—Grassy cliffs at seashore, 20 feet above sea-level, Turnpike, Dingieshowe Bay, Saint Andrews, Mainland, 12th May 1921, H. H. Johnston; and grassy and shingly seashore, 5 feet above sea-level, Stembuster, Clivie Bay, Saint Andrews, Mainland, 12th May 1921, H. H. Johnston. Not native. One plant at Turnpike, and two large clumps of plants at Stembuster,

only seen by me. Plants not in flower or fruit. Mr. J. Anderson, Turnpike, *in litt.*, dated 27th February 1922, informs me that the Rhubarb plant now growing on the grassy cliffs at Turnpike was taken out of the garden at Turnpike House about 1912 and thrown over the cliffs, and that Mr. David Laughton, Greens, Saint Andrews, Mainland, Orkney, seeing it lying there, planted it. Mr. James Skea, Stembuster, *in litt.*, dated 2nd March 1922, informs me, with reference to the two large clumps of Rhubarb growing on the seashore below Stembuster House, that some Rhubarb plants were thrown out of the garden at Stembuster, and that "a man James Laughton planted them below the beach about 30 years ago, and there they have grown and thriven without any cultivation, many times in winter being covered with foam of the sea." Mr. J. Skea also informs me that the Rhubarb plants growing at Stembuster seashore produce flowers.]

SALIX PHYLICIFOLIA, *Linn.* × REPENS, *Linn.* ♂ and ♀. —Ditch side, 50 feet above sea-level, Meadow of Greenay, Birsay, Mainland, 26th May 1921 (plants in flower), and 29th June 1921 (male plants in leaf only, and female plants in leaf and ripe fruit), H. H. Johnston. Native. Rare. Plants growing among SALIX REPENS, *Linn.*, and within 200 yards of SALIX PHYLICIFOLIA, *Linn.* The young leaves of the male and female plants in flower on 26th May 1921 were green above, paler green beneath, and thinly clothed on both surfaces with short, adpressed, whitish hairs. With reference to my male specimens, the Rev. E. F. Linton, in a note dated 29th December 1921, writes as follows:—"S. PHYLICIFOLIA × REPENS very possibly. On the scanty material I don't feel positive," and, with reference to my female specimens, he writes as follows:—"S. PHYLICIFOLIA × S. REPENS, is a very likely solution. In most respects differing little from S. REPENS. There is the broader leaf in 1267 [my Reference No., H. H. Johnston], and in some cases the styles, usually very short, are slightly or pl. m. elongate. The buds are indeterminate, but seem to indicate something besides REPENS, and being ± pointed approach S. PHYLICIFOLIA." A new record for this hybrid for H. C. Watson's county No. 111 Orkney.

POTAMOGETON PECTINATUS, *Linn.*, *var.* DIFFUSUS, *Hag-*

ström (*fide* Arthur Bennett).—Mud at bottom of water, 3 feet deep, in a loch, 12 feet above sea-level, Loch of Wasbister, Rousay, 19th July 1921, H. H. Johnston. Native. Common. Plants in flower, and wholly submerged in water. A new record for this variety for H. C. Watson's county No. 111 Orkney.

POTAMOGETON PECTINATUS, *Linn.*, *var.* UNGULATUS, *Hagström* (*fide* Arthur Bennett).—Mud at bottom of nearly fresh water, Bay of Islands, Loch of Harray, Stenness, Mainland, 26th September 1921, H. H. Johnston. Native. Common in the channel between Long Holm and the small island immediately to the south-east of it. Plants in ripe fruit. With reference to my specimens, Mr. Arthur Bennett, in a note dated 19th November 1921, writes as follows:—"The rigid lower sheaths and leaves are a characteristic of this." A new record for this variety for H. C. Watson's county No. 111 Orkney.

POTAMOGETON FILIFORMIS, *Nolte*, *form* ALPINUS, *Blytt*, "Norges Flora," vol. i, p. 370 (1861) (*fide* Arthur Bennett).—Mud at bottom of brackish water, 5 feet deep, in a loch at sea-level, near the *noust* for boats, Nether Bigging, Loch of Stenness, Stenness, Mainland, 2nd August 1920, H. H. Johnston; and shell-sandy mud at bottom of water, about 1 foot deep, in a loch 10 feet above sea-level, Loch of Rummie, Lady, Sanday, 27th August 1920, H. H. Johnston. Native, common, and plants in flower at both stations. A new record for this form for H. C. Watson's county No. 111 Orkney.

POTAMOGETON FILIFORMIS, *Nolte*, *form* LUXURIOSUS, *Hagström* in Neuman's "Sveriges Flora," p. 794 (1901) (*fide* Arthur Bennett).—Mud at bottom of brackish water in a loch, almost at sea-level, near the Bridge of Brogar, Loch of Harray, Stenness, Mainland, 24th September 1880, H. H. Johnston; and mud at bottom of running water, 1¼ foot deep, in a burn, 26 feet above sea-level, Skaill Burn, Sandwick, Mainland, 4th October 1921, H. H. Johnston. Native, common, and plants in ripe fruit at both stations. A new record for this form for H. C. Watson's county No. 111 Orkney.

POTAMOGETON FILIFORMIS, *Nolte*, *form* MAJOR, *Tiselius*, "Exsic. Suec.," fas. 3, Nos. 114 and 115 (1897) (*fide* Arthur

Bennett).—Mud at bottom of stagnant water, Birsay, Mainland, 26th July 1883, H. H. Johnston; and mud at bottom of shallow water in a loch, 11 feet above sea-level, Loch Echna, Burray, 27th July 1914, H. H. Johnston. Native. Rare at Loch Echna. Plants in fruit at both stations. A new record for this form for H. C. Watson's county No. 111 Orkney.

POTAMOGETON PANORMITANUS, *Bivona* (*fide* Arthur Bennett).—Mud at bottom of water in a loch, 49 feet above sea-level, Loch of Kirbister, Orphir, Mainland, 9th August 1878 (plants in unripe fruit) and 30th August 1880 (plants not in flower or fruit), H. H. Johnston. Native. A new record for this species for H. C. Watson's county No. 111 Orkney, published by Dr. G. Claridge Druce in "Bot. Exch. Club Secretary's Report for 1920," p. 152 (September 1921).

POTAMOGETON LUCENS, *Linn.* (name confirmed by Arthur Bennett), and *var.* INSIGNIS, *Tiselius* (*fide* Arthur Bennett). —Mud at bottom of water, 11 feet deep, in a loch, 323 feet above sea-level, Muckle Water, Rousay, 23rd July 1921 (plants in flower-bud) and 22nd August 1921 (plants in full flower), H. H. Johnston. Native. Common. Plants submerged in water except the flower-spikes. Mr. Arthur Bennett, to whom all my specimens were submitted, writes as follows, in a note dated 1st December 1921:—"There is no doubt the whole of these specimens must be named P. LUCENS, *Linn.* As a rule the leaves are narrower than the type specimen in the Linnean herbarium. I have looked up my seventy-six specimens from all over the world where LUCENS occurs and there is nothing that exactly matches your specimens." A few of my specimens Mr. Arthur Bennett has identified as *var.* INSIGNIS, *Tiselius*. Confirms the record of this species from Orkney (no station mentioned) in the Rev. Dr Barry's "History of the Orkney Islands," ed. ii, p. 278 (1808); and the *var.* INSIGNIS, *Tiselius*, is a new record for H. C. Watson's county No. 111 Orkney. See "Journ. Bot.," No. xiii, p. 16 (January 1864); Watson, "Top. Bot.," ed. ii, p. 417 (1883), where county No. 111 Orkney is shown thus "[10, 111, 112; errors ?]"; "Annals Scot. Nat. Hist.," No. 31, p. 171 (July 1899); Bennett, "Suppl. Top. Bot.," p. 84 (1905); Spence, "Flora

Orcadensis," p. 72 (1914), where the record "Stromness (1910; Dr. Grant)" is an error; and "Trans. Bot. Soc. Edin.," vol. xxviii, p. 57 (1920).

POTAMOGETON PRAELONGUS, *Wulfen.* (name confirmed by Arthur Bennett).—Mud at bottom of water, 1½ foot deep, in old quarry holes in the bed of a loch near the shore, 13 feet above sea-level, north-east and south-west of the windmill pumping station (formerly a boat-house), Loch of Tankerness, Saint Andrews, Mainland. Native. Rare. Plants not in flower or fruit. Confirms the record of this species from Orkney ("Loch of Tankerness") by the late Mr. Magnus Spence in his "Flora Orcadensis," p. 71 (1914).

POTAMOGETON HETEROPHYLLUS, *Schreb., form* GRACILIS (*Wolfg.*) [=POTAMOGETON WOLFGANGII, *Kihlman*] (*fide* Arthur Bennett).—Mud at bottom of water, 4 feet deep, in a loch, 13 feet above sea-level, Loch of Tankerness, Saint Andrews, Mainland, 19th July 1883 and 12th August 1921, H. H. Johnston. Native. Common. Plants in flower, without any floating leaves. A new record for this form for H. C. Watson's county No. 111 Orkney. I have a specimen of POTAMOGETON HETEROPHYLLUS, *Schreb.* (*fide* Arthur Bennett), with floating leaves, collected by me, in the Loch of Tankerness, on 12th August 1921.

POTAMOGETON HETEROPHYLLUS, *Schreb., var.* INTERMEDIUS (*Tiselius*) (*fide* Arthur Bennett).—Mud at bottom of water, 5 feet deep, in a loch, 49 feet above sea-level, Loch of Kirbister, Orphir, Mainland, 9th August 1878 and 30th August 1880, H. H. Johnston. Native. Common. Plants in fruit, with and without floating leaves. Confirms the record of this variety from Orkney (Loch of Kirbister), in "Scot. Nat.," No. i, new series, p. 24 (July 1883). See "Bot. Exch. Club Report for 1880," p. 36 (1881), with reference to a "form with broad-based submerged leaves," of POTAMOGETON HETEROPHYLLUS, *Schreb.*, collected by the late Dr. J. T. I. B. Boswell, in the Loch of Kirbister, in July 1875; "Journ. Bot.," vol. xxxix, p. 273 (August 1901); "Annals Scot. Nat. Hist.," No. 71, p. 180 (July 1909); and Spence, "Flora Orcadensis," p. 73 (1914).

POTAMOGETON NITENS, *Weber, var.* SUBGRAMINEUS, *Hagström, form* STENOBASIS, *Hagström* (*fide* Arthur Bennett).—Mud at bottom of nearly fresh water, 3 feet

deep, in a loch almost at sea-level, Bay of Islands, Loch of Harray, Harray, Mainland, 2nd August 1920, H. H. Johnston. Native. Rare. Plants in flower. Peduncles 4–5 inches long, with flower spikes ⅝–1 inch long. My specimen and the specimens collected at the same time by Prebendary R. J. Burdon and Dr. G. Claridge Druce, in my company, grew sparingly in the channel between Ling Holm and the small island immediately to the north of it. With reference to my specimen, Mr. Arthur Bennett, in a note dated 11th November 1920, writes as follows:—"A very peculiar plant. If NITENS it will come under *d.* SUBGRAMINEUS, *Hagström, form* STENOBASIS, *Hagström,* 'Critical Researches on Potamogeton,' p. 224 (1916); seems to be recorded only from Sjögesäter in Sweden. It is the nearest form to HETEROPHYLLUS." See "Bot. Exch. Club Report for 1872–1874," p. 40 (1875), where under P. NITENS, *Weber,* Dr. J. T. I. B. Boswell writes as follows:—"A single specimen gathered by me in the Bay of Islands, Upper Loch of Stenness [the Loch of Harray is meant—H. H. Johnston], August 1873"; and, with reference to Dr. Boswell's specimen, Mr. Arthur Bennett, in "Scot. Nat.," No. i, new series, p. 24 (July 1883), writes as follows:—"I believe this is correct; it is of course widely different from the *curvifolius, Hait.,* and comes between Weber's type and *var. latifolius, Tis.!*" See also "Bot. Exch. Club Secretary's Report for 1920," p. 151 (September 1921).

POTAMOGETON POLYGONIFOLIUS, *Pourr., var.* CORDIFOLIUS, *Asch. et Graebn.* (*fide* Arthur Bennett).—Mud at bottom of water in a ditch in a peat moss, Kingsdale, Firth, Mainland, 15th September 1880, H. H. Johnston. Native. Plants in fruit. A new record for this variety for H. C. Watson's county No. 111 Orkney.

ISOETES LACUSTRIS, *Linn.* (name confirmed by Arthur Bennett).—Mud at bottom of water, 7 feet deep, in a loch, 328 feet above sea-level, Peerie Water, Rousay, 22nd August 1921, H. H. Johnston. Native. Common in the deepest parts of the loch where the bottom is muddy. Plants in full fructification, growing close together in dense tufts, and wholly submerged in water. Leaves suberect, or recurved, subulate, roundish-quadrangular, dark green, with four longitudinal jointed tubes. Larger spores globose,

bluntly tubercled, pale yellowish-white. I found no plants of this species growing on the stony bottom of the shallow water along the margin of the loch, where flowerless plants of LITTORELLA LACUSTRIS, *Linn.*, grow in abundance. Confirms the late Mr. Robert Heddle's record of this species from Rousay, in "Scot. Nat.," No. iii, new series, p. 113 (January 1884); and the late Mr. Alexander Somerville's record of it from Peerie Water, Rousay, 12th July 1901, in Bennett, "Suppl. Top. Bot.," p. 114 (1905), and in "Trans. Bot. Soc. Edin.," vol. xxvii, p. 58 (1916). See "Annals Scot. Nat. Hist.," No. 34, p. 107 (April 1900); and Spence, "Flora Orcadensis," p. 96 (1914). The late Dr. A. R. Duguid recorded ISOETES LACUSTRIS, *Linn.*, from the Loch of Carness, Saint Ola, Mainland, in his manuscript "Flora Orcadensis," (1858), but this record is most probably an error, because the Loch of Carness is a tidal one and contains brackish water, and on 16th September 1921 I failed to find either this species or LITTORELLA LACUSTRIS, *Linn.*, in the loch.

CHARA CONTRARIA, *Kützing* (*fide* James Groves).—Gravelly mud at bottom of shallow running water in a burn, 200 feet above sea-level, Quendale, Rousay, 15th June 1921, H. H. Johnston; mud at bottom of water, 5 feet deep, in a loch, 28 feet above sea-level, Loch of Bosquoy, Harray, Mainland, 30th September 1921, H. H. Johnston; and shell-sandy mud at bottom of water, 1½ foot deep, in a loch, 10 feet above sea-level, North Loch, Lady, Sanday, 8th October 1921, H. H. Johnston. Native. Rare at Quendale, and common in the Loch of Bosquoy. Plants slightly fetid, wholly submerged in water, and at the Loch of Bosquoy and North Loch they were in fructification. In a sheet of CHARA ASPERA, *Willd.*, collected by the late Mr. F. C. Crawford, in the Loch of Skaill, Sandwick, Mainland, Orkney, in September 1901, and now in the herbarium of Mr. James Groves, there are a few scraps of CHARA CONTRARIA, *Kützing* (*fide* James Groves). A new record for this species for H. C. Watson's county No. 111 Orkney.

CHARA CONTRARIA, *Kützing*, *var. b.* HISPIDULA, *Braun.* (*fide* James Groves).—Mud at bottom of water, 3 inches deep, in a pool, 62 feet above sea-level, The Loons, Birsay,

Mainland, 1st October 1921, H. H. Johnston. Native. Common. Plants wholly submerged in water. A new record for this variety for H. C. Watson's county No. 111 Orkney.

Note on Juvenile Characters in Root and Stem Cuttings of Acanthus montanus. By L. B. Stewart.

(Read 18th May 1922.)

Taking a root of Acanthus about a foot long, dividing it into portions of from 3 to 4 inches, and placing these in a propagating case, it is found that the portion with the root apex attached continues to elongate, while the other portions generally develop side roots near the basal ends. In root cuttings of Acanthus there is always a tendency on the part of the cutting to produce more roots to begin with than there is for shoot production. On the meristematic tissue at the upper ends of each portion buds are formed of which one or two produce growth shoots, the remaining buds lying dormant. Seldom are more than two growth shoots sent up. Should three or four growths start away they have very short internodes and are weak in growth. The dormant buds remain fresh and green for two or three years and are ultimately overgrown by the growth shoots. Should, however, the growth shoots be knocked off or be cut off, one or more of the dormant buds will produce growth shoots.

The appearance of the growth developed from the three portions of root show marked contrasts. The shoot developed from the youngest piece of root which bears the root apex is juvenile in character whereas the growth formed on the oldest portion shows much more adult characters.

Bud formation on the normally lower end of the root portion is more difficult to induce, but this can be accomplished by inserting the portion of root first in the normal position until callus has formed, then by inverting the cutting and at the same time giving the callus a wound stimulus, buds are thereafter formed. Buds formed on the

inverted cutting are not so numerous as are the buds formed on the normally placed cutting. Even after a growth shoot has developed from the normally basal end of an inverted cutting it will often be found that roots are produced from the base of this growth shoot. If these roots are allowed to develop the growth shoot soon disconnects itself from the parent cutting. The remaining buds on the inverted cutting are somewhat difficult to start into growth, but this can be done by hot water stimulation.

On the inverted cutting the growth shoots exhibit very juvenile characters and the leaves are miniature. Such leaves are rarely seen even on seedlings unless the seeds are small and weak. Further, the growth on the inverted cutting takes a longer time to pass through the transitional stages to the adult form.

In stem cuttings the same gradation in growth forms from juvenile to adult character is seen. A stem cutting, consisting of the terminal portion of the plant when rooted, goes on growing without showing any change in form. On an internodal cutting with one bud in the leaf axil the growth produced shows a juvenile form, while the growth from an internode with no preformed buds left adhering shows a very markedly juvenile growth form. All juvenile forms again show marked similarity to seedlings.

OBITUARY NOTICE.

WILLIAM CARRUTHERS, 1830–1922.

The recent death of a Fellow of this Society elected so long ago as 1858 merits some notice, especially as he took an active part in the development of modern British botany. William Carruthers was born at Moffat, 29th May 1830, and he died 2nd June last, a record even for the proverbially long-lived botanist. After early education at Moffat Academy, he entered the University of Edinburgh in 1845, and, like many another student, a slender income needed to be supplemented by tutorial work, so we find

him still a student in 1854. In that year he joined New College, Edinburgh, to study for the ministry, and he must have shown exceptional ability in natural science, as John Fleming, Professor of Natural Science in that college, advised him to specialise in science. A period of further study under John Hutton Balfour, George Allman, and John Goodsir made him a possible successor to Dr. Fleming in 1858 when John Anderson was elected to the chair in New College. Forty-five years later Mr. Carruthers was appointed to discharge the duties of the Chair of Natural Science at New College during the session 1903–1904. After a short period as Lecturer in Botany at the New Veterinary College, Edinburgh, and Assistant Secretary to the Royal Society of Edinburgh, Mr. Carruthers joined the staff of the British Museum in 1859, thus reaching his life's work. From this time onwards his sphere was in London, but in 1879 he was a candidate for the Chair of Botany in Edinburgh, when Professor Dickson was appointed.

A brief review of the work of William Carruthers has more than a personal interest, for he was active during a period when botany in Britain passed through great developments. During his time notable advances were made in fossil botany, and in this field Carruthers was amongst the pioneers. His geological investigations occupy many papers, beginning with discoveries of new Dumfriesshire Graptolites in 1858, and a description of the geology of Moffat in 1859, both published by the Royal Physical Society of Edinburgh. The Transactions of the Botanical Society include in 1866 his important paper on *Lepidodendron* and *Calamites*. A more important contribution from our present standpoint is that "On Fossil Cycadean Stems from the Secondary Rocks of Britain," in the Transactions of the Linnean Society of London in 1870. Amongst these the description of the vegetative organs and fructifications of *Bennettites* established a group which has become an important link in the early ancestry of plants. Recognition of this and later work followed, and amongst other honours he was elected Fellow of the Linnean Society in 1861, and president from 1886 to 1890; Fellow of the Royal Society in 1871; president of the Geologists Asso-

ciation of London in 1875–76; president of the Biological Section of the British Association in 1886; Ph.D. of Upsala University, conferred at the bicentenary celebration of the birth of Linnaeus in 1907.

As administrator in the British Museum, the work of William Carruthers is perhaps less widely known, but none the less important. He joined that institution in 1859, as assistant when J. J. Bennett assumed the Keepership, vacant by the death of Robert Brown. The staff was Mr. Bennett and himself, and the department for botany was a small, crowded gallery in the Bloomsbury building. It was under these conditions that Carruthers did his research for the next ten years. His appointment as Keeper in 1871 brought him into a stormy period. A Royal Commission was then reviewing the position of scientific instruction in Britain, and botany at the British Museum came under severe criticism. The attack came from two sides; from Kew, which claimed a monopoly of collections, museums, and libraries, and from the teaching colleges of London. The result was that the British Museum department remained and the Keeper proceeded to develop its activities. Botany, with Zoology and Geology, was transferred in 1881 to the new Natural History Museum in Cromwell Road, and enlarged accommodation meant extension and arrangement of the exhibits. A library was also established, and as recorded later by one of his colleagues: "Mr. Carruthers' knowledge and appreciation of botanical literature was exercised to such admirable effect that it may be doubted whether a finer botanical library exists." Recognising the importance of cryptogamic botany, Mr. Carruthers laid the foundation of the present collections with the assistance of Henry Trimen and George Murray. A further encouragement was the publication of Crombie's "Enumeration of British Lichens," and Lister's "Monograph of Mycetozoa." When Mr. Carruthers retired in 1895 his staff consisted of five assistants in place of one in 1859.

Agricultural botany was another development, and Mr. Carruthers has left the history of this in the Journal of the Royal Agricultural Society (vol. lxx, 1909). Fifty years ago there was no organisation whereby farmers

could ascertain whether seeds were good or bad. The Royal Agricultural Society consulted with Mr. Carruthers, with the result that he became consulting botanist to the Society and retained this post for thirty-eight years. By 1883 several of the larger seed firms began to give guarantees of purity and germination, and through the agricultural societies these could be checked by an impartial test. The seed-testing stations arose from this beginning, so that now no farmer need purchase bad seed. Another great change was the increased attention given to "natural" grasses suitable for meadows and pastures. Mr. Carruthers has thus taken an important part in developments of great consequence to agriculture. He has seen his forecasts confirmed and brought into the ordinary practice of a fraternity, the farmers, who are not too easy to move. Weeds, injurious plants, and parasitic fungi also came within the scope of his work as consulting botanist, and all agricultural botanists must acknowledge the usefulness of his reports and observations.

It is not without interest in the career of a public servant to see the man himself. William Carruthers had another side. The "British Weekly," in a lengthy obituary, refers to him as "one of a band of zealous elders of the English Presbyterian Church," who took an active part in Church organisation, including a union of the two branches of that Church in England. He edited the "Children's Messenger" for forty-two years, thus demonstrating by actual labour his interest in his Church. He was also keenly interested in Puritan history and biography.

Personally I cannot add much, but there was an occasion when a student, returning from a period of study abroad, invaded the British Museum and received a cordial welcome from the Keeper, who along with Mr. George Murray gave every facility for reference to the cryptogamic collections of the Museum. This, I believe, represents the experience of all botanists who sought the assistance of William Carruthers.

WILLIAM G. SMITH.

NOTES ON CHINESE LILIES. By Professor WILLIAM WRIGHT SMITH. (With Pls. IV.–VII.)

The following notes have been rendered possible by the kindness of Professor Henri Lecomte, Director of the Herbarium of the Paris Museum, who has given me the opportunity of examining the type specimens of the species of Lilium described by the late M. Franchet. The bulk of the material otherwise available was collected by Mr. George Forrest during his various explorations in Yunnan and Western Szechwan. This has been supplemented by collections of other travellers and especially by the acquisition of the Chinese Herbarium of the late Monseigneur Léveillé, containing types of many imperfectly known plants described by him. The necessary data in herbaria and in gardens on which to found an adequate account of the Chinese Lilies as a whole are still far from complete, and the present notes deal for the most part with species for which recently acquired material has served as a basis for ampler description and possibly more precise definition. The material is rich in collections from Western China, but the species of Northern and Eastern China are comparatively poorly represented. These notes will consequently refer chiefly to the western species. I have taken certain well-marked western species as subordinate centres round which to arrange what seems to me to be their near allies. I have had an opportunity of discussing the Yunnan species very fully with Mr. George Forrest, who has returned again to that province for further exploration. He has been kind enough to say that he will make observations on the western species in their natural state, and try to solve some of the difficulties which presented themselves both to him and to me. I have also had the privilege of discussing most of the species with the late Mr. H. J. Elwes, F.R.S., the monographer of the genus, with Mr. A. Grove, and also with Mr. E. H. Wilson, Assistant-Director of the Arnold Arboretum, the well-known Chinese explorer whose writings are familiar to all interested in the genus.

It would perhaps be too much to expect that in such a critical group as the Lilies we should all be in accord as regards our views, but I think I may safely say that our points of agreement are many and our points of disagreement comparatively few. The present notes express the views taken by Mr. Forrest and myself on the species we have ventured to discuss. The abundant literature on the genus Lilium is almost in itself an index of the numerous difficulties botanists have found in coming to definite conclusions regarding the distinctness of the individual species. The Chinese Lilies are no exception, and present many difficulties. The number of species described has increased very considerably since 1884 when Mr. Elwes, at the International Botanical Congress at St. Petersburg, cited only ten species, of which three were doubtful, as being indigenous to China and Tibet. Franchet in his paper (Journal de Botanique, vi, 1892, p. 305) on the Lilies of China and Tibet in the herbarium of the Paris Museum more than doubled that number. And since 1892 many more have been added. In his paper Franchet gives a key to the Chinese species, as understood by him, and lays stress on the character of the nectariferous furrow. I have found that character of the greatest service. He gives also two warnings which are worthy of repetition. The first deals with the original description of the Chinese and Japanese Lilies:—

"L'étude des espèces du genre Lis a été rendue très difficile, au moins pour celles qui sont d'origine chinoise ou japonaise, par la multiplicité de leurs formes dans les cultures. En effet, contrairement à ce qui se passe d'ordinaire, où l'on voit les formes spontanées décrites les premières, c'est-à-dire avant toute modification due à l'intervention de l'homme, il est arrivé que beaucoup de Lis ont été décrits d'après des individus cultivés; ces Lis sont, pour la plupart, réellement originaires de la région qu'on leur assigne pour patrie, mais ils ont été presque tous trouvés par les importateurs dans les jardins, où ils avaient préalablement subi des modifications plus ou moins profondes. Or on sait que les jardiniers chinois et japonais sont passé maîtres dans l'art de transformer les plantes."

When Franchet wrote the above he had no doubt in mind the Lilies of Japan and the maritime provinces of China, but from the explorations of Wilson and of Forrest we know that some of the indigenous species of Western China have been cultivated for many generations as an article of food Cultivation in such extensive provinces as Szechwan and Yunnan with their great divergences in climate has no doubt tended to produce cultural races in the species used for food. Franchet's caveat must therefore be borne in mind in all questions dealing with the delimitation of the species of the area.

My second extract from Franchet is as follows:—

"Mais comme, en même temps, tous les groupements des espèces de Lis ont pour base cette forme du périanthe, il en résulte de sérieuses difficultés lorsqu'il faut comparer une forme cultivée avec son type spontané, ou ce que l'on considère comme tel. La difficulté est encore augmentée par ce fait que la direction dressée ou révolutée des divisions du périanthe ne se manifeste complètement que tardivement et, en général, seulement après le fécondation."

Baker's division of the known Lilies into five groups (Journ. Linn., Soc. xiv (1875), p. 225) affords a useful conspectus of the species, but all who have dealt with the genus know that there are several species which seem to hover between two groups and even form a transition from one to the other. I think it therefore apposite to recall Franchet's words.

Another element of complexity is introduced by the peculiar geographical conditions of Western Yunnan and to a certain extent of Szechwan. Recent work on the flora of these regions tends to show that there are several quite distinct geographical areas in these regions and that what at first appear to be conspecific plants in adjoining areas show, after investigation, differences which are not far from specific. Yunnan, owing to the peculiarities of its natural features, appears to be rich in geographical races. This separation of areas seems to me to be due in great part to the depth of the valley floor separating one mountain range from another. In a great number of these Yunnan valleys the floor descends to an elevation little

above sea-level. The ranges are consequently separated in some cases by a sub-arid tropical region, in others by a moist valley with dense tropical vegetation. Such a configuration induces isolated botanical regions with resultant specific divergences in many genera. As Professor Sir Isaac Bayley Balfour pointed out to me, this may not affect Lilium and allied bulbous genera to the same extent as other genera which are more responsive to edaphic conditions.

The first group I propose to discuss is that which centres round *Lilium taliense*, Franchet.

I.

Lilium taliense, Franchet, and its Allies.

Among the Asiatic Martagons this species and its near allies are well defined by the nectariferous furrow being without papillae, and consequently smooth and naked. As Franchet pointed out (Journ. de Bot., vi, p. 320, 1892), the Asiatic species having this peculiarity are *L. speciosum*, *ochraceum*, *taliense*, and *polyphyllum*. *L. speciosum* (one of the Archelirions) has no affinity with *taliense*, and I need not discuss it here. *L. polyphyllum* is apparently confined to the Western Himalaya, and in its bulb and other characters is readily distinguished from the Chinese members of this alliance. In China, therefore, we are concerned in the first place with Franchet's two species, *L. ochraceum* and *L. taliense*. But since Franchet's time there have been additions. Léveillé has described five lilies of this series from Yunnan and Kweichow—*L. Bodinieri*, *L. Feddei*, *L. majoense*, *L. Pyi*, and *L. Tenii*. Of these the Edinburgh herbarium now possesses the types with the exception of that of *L. Pyi*, which is unfortunately absent from Léveillé's collection. Of it I can therefore say nothing but that Léveillé places it near *L. concolor* of the Isolirions, while his description suggests a Martagon. *L. nepalense*, D. Don, must also be considered in this connection as it has been held, and with some reason, that *L. ochraceum* is only a form of that Himalayan plant. The admission of *L. nepalense* for discussion in the series implies also an examination of *L. primulinum*,

Baker. There is also an addition to the series which will be described later in this paper, *L. Stewartianum*, Balf. f. et W. W. Sm., a very pretty, dwarfish Martagon, with solitary flowers, allied closely to *L. taliense*.

Of *L. taliense* several gatherings were made by Forrest. One of these, No. 7022, comes from the eastern flank of the Tali Range quite near to the area from which Delavay collected the type. I have compared this Tali Range plant of Forrest with Delavay's type and it agrees exactly. Forrest describes his plants as from 2½–5 feet high with the flowers pure white, spotted maroon, and fragrant. It occurs amongst open and mixed scrub. Conspecific with this is Forrest 2716 from the eastern flank of the Lichiang Range, growing in open, shady, situations in mixed forests. Forrest describes the plant as 4–8 feet high, the flowers being pure waxy white, spotted purplish-lake, and fragrant. The inflorescence has as many as seven flowers and is more robust than Franchet's type with only one or two. Still more robust is a plant collected by Forrest in the same locality under No. 6152. Forrest describes this as from 4–10 feet high, with fragrant, white flowers, spotted crimson. One of the specimens shows ten flowers. Forrest also collected a plant under No. 10,473 in the mountains in the north-east of the Yangtze Bend. The white, fragrant flowers are spotted purple, and the plant is 4–5 feet high. The specimen of this number in the Edinburgh herbarium bears eleven flowers. Beyond differences in vigour these specimens show practically no divergence from the type. In Franchet's key (J. de Bot., vol. vi, p. 309) *taliense* is given with "fleurs purpurines," but in his description, p. 319, it is "albidi." The latter is correct.

As *L. Stewartianum*, Balf, f. et W. W. Sm., is closely akin it will be convenient to discuss it here. Forrest found the type of this species in July 1913 on the mountains on the north-east of the Yangtze Bend, No. 10,647. The flowers are of a deep olive-yellow, but almost black with deep crimson-maroon markings, and fragrant. This plant he found again in July 1914 on the Chungtien Plateau at 12,000 feet, No. 12,734. In July 1913 he also discovered on the north-west of the Lichiang Range a

lighter coloured form, No. 10,659, which is undoubtedly conspecific. He described the flower of the last as greenish-yellow, profusely spotted maroon. The species is readily distinguished from *L. taliense* by the smooth stem and by the solitary flowers—of the fifteen plants collected all have solitary flowers. From *L. ochraceum* the long, grass-like leaves give an easy means of distinction. A detailed description is appended. (See also Pl. IV.)

Lilium Stewartianum, Balf. f. et W. W. Sm. Sp. nov. Species sectionis Martagon et affinis *L. ochraceo*, Franch. et *L. taliensi*, Franch.; ab hoc habitu graciliore, caulibus glabris laevibusque, floribus semper solitariis flavidis differt; ab illo habitu graciliore, foliis gramineis, floribus solitariis inter alia recedit.

Planta 45–50 cm. alta ex collectore. Bulbus circ. 2–3 cm. longus, ovatus, squamis ovato-lanceolatis tenuibus in sicco flavidis, radicibus basi sat bene evolutis. Caulis erectus glaber epapillosus; pars hypogaea 5–8 cm. longa haud repens radicibus destituta; pars epigaea basi nuda mox foliis bene vestita. Folia plus minusve 20, erecta et vix patentia, 5–8 cm. longa, circ. 2 mm. lata, acuta, ad insertionem vix angustata, omnia sparsa, plana, tantum sub lente valida margine scabridiuscula, glabra; infima nonnunquam breviora et ad 5 mm. lata; supremum saepe ad basim floris solitarii attingens. Pedunculus 6–7 cm. longus flore nutante fragrante. Perianthii pars tertia tubulosa; segmenta subrevoluta, fere 4 cm. longa, medio circ. 9 mm. lata, oblonga, obtusiuscula, saturate olivaceo-flava, maculis atrokermesinis densissime ornata; sulcus nectariferus nudus glaber. Staminum filamenta 2·5 cm. longa, glabra; antherae 8–9 mm. longae, in sicco brunneae. Stylus in flore bene evoluto dissecto tantum 1 cm. longus ovario 1·5 cm. longo brevior, nonnumquam ovarium subaequans, certe duplo vel triplo haud superans ut apud *L. taliense* vel *L. ochraceum*. Fructus deest.

"West China—Mountains in the N.E. of the Yangtze Bend, Yunnan, on open stony pasture. Lat. 27° 45′ N. Alt. 11,000 feet. Plant of 18–20 inches. Flowers, ground-colour deep olive-yellow, but almost black with deep crimson-maroon markings, fragrant. July 1913." G. Forrest. No. 10,647.

"Mountains of the Chungtien plateau. Lat. 27° 30′ N. Alt. 12,000. July 1914. Duplicate of 1913." G. Forrest. No. 12,734.

The following with less darkly spotted perianth is the same species.

"West China.—N.W. flank of the Lichiang Range, Yunnan, on ledges of limestone cliffs and stony pasture. Lat. 27° 35′ N. Alt. 12,000 feet. Plant of 2 feet. Flowers greenish-yellow, profusely spotted maroon, fragrant. July 1913." G. Forrest. No. 10,659.

I come now to *L. ochraceum*. There has been much confusion regarding this species. The identification of species from W. Yunnan and Northern Burma is involved in many cases owing to the fact that Franchet described so many plants from the standpoint of the Paris herbarium, while others from the same area were described from the standpoint of Indian and Burmese collections in the herbaria of Kew, Calcutta, and the British Museum. Paris lacks reliable sheets of many Indian species, while, conversely, in this country authentic representations of many of Franchet's species are unavailable. This is obvious in many genera besides *Lilium*. In the present instance *L. nepalense*, D. Don, is the plant from which *L. ochraceum* can only with some difficulty be distinguished. In his diagnosis of *L. ochraceum*, Franchet makes no reference to *L. nepalense*. This was hardly to be expected as Franchet dealt with *ochraceum* as a lily with its perianth segments completely recurved at the end of anthesis—that is, he treated it as a Martagon in the strict sense. We shall see whether Franchet was justified in his assumption. *L. nepalense* has since been recorded from both Yunnan and Northern Burma. The first Burma record (Collett and Hemsl. in Journ. Linn. Soc., vol. xxviii, p. 138) was later seen to be an error and the plant identified as *L. nepalense* was subsequently named *L. Lowii*, Baker (Bot. Mag., tab. 7232). *L. primulinum* on its discovery in Upper Burma was referred first of all to *L. neilgherrense* and its affinity with *L. nepalense* was not suggested. But in addition to these there is undoubtedly to be found in Upper Burma and on the Chinese-Burmese frontier a lily almost indistinguishable, perhaps indistinguishable, from *L. nepalense*.

Mr. Farrer collected it on Hpimaw Hill in full flower in July 1919, and in the same month Mr. Forrest got it on the N'mai-kha Salween divide in Yunnan. I have no doubt that bulbs of this plant have reached this country more than once within the last thirty years. Along with it no doubt were imported bulbs of *primulinum* and *Lowii* as well as of a plant[1] closely resembling *neilgherrense* and *Wallichianum*. Perhaps mixing of these bulbs gives the reason for the confusion of such plants as *neilgherrense*, *Lowii*, and *nepalense*, which have little in common. The record in the horticultural journals supports this statement. In the "Garden" for 6th October 1900 I find the following:—

"When Upper Burmah was first opened up by our military authorities a great many bulbs of *Lilium nepalense* were sent to this country, but of late this lily has not been so plentiful."

In the "Garden" for 12th October 1895:—

"It is certainly a very distinct lily, and though the flowers are beautiful, it is not at all likely that it will become a popular lily as it often runs up tall and weak, and is after the first season not very amenable to cultivation. The additional numbers seen this year may, I think, be attributed to the fact that a few large importations came to this country in the spring, and one at least of considerably over 1000 bulbs was disposed of at the London auction rooms as mixed species from the Shan States of Upper Burmah. These seem, however, to be nearly all *L. nepalense*, at least as far as I have seen them in flower. There is a certain amount of variation to be found in the flowers of this lily, as in some the chocolate at the basal half of the petals extends much farther down than others, while the greenish-yellow of the rest of the flower also varies in hue."

I call attention to this note particularly as the behaviour of *L. ochraceum* in the garden is quite another story. There are other references giving Burma as a habitat, and

[1] Possibly *L. myriophyllum*, Franch., and certainly *L. sulphureum*, Baker, were included in these bulb collections, but these two are probably one and the same species.

all appear to agree that *nepalense* is rather a difficult lily to cultivate. Mr. Grove in his book on Lilies (p. 34) indicates the same opinion:—

"As grown in temperate houses in this country the Lily is not so beautiful as many, and the distinct suspicion of green in the yellow of the flower, which one may notice sometimes in certain of the Narcissi, somehow conveys the impression that the plant needs more sun to develop the true colours."

The Chinese record of the occurrence of *nepalense* (C. H. Wright in Jour. Linn. Soc., vol. xxxvi, p. 133), quotes Henry 9230 and Hancock 392, but is qualified by the statement that *nepalense* is a species with numerous forms. *L. ochraceum* and the Yunnan plants which have been identified as *L. nepalense* in the above record have a wide range in that province. They occur in the Tali and Lichiang ranges, on the Tengyueh side of the province, and also in the much drier eastern part of the province near Yunnan-sen, extending from there into Kweichow. This gives a considerable variation of habitat starting from the drier eastern Yunnan, passing through the moderately wet Tali and Lichiang areas and ending in the wetter Tengyueh and Upper Burma zone. The plants of the latter area are the ones which approximate most to the Nepal plant. The changes in the character of this lily vary as the course is taken westwards. In the drier Chinese areas we start with a definite Martagon Lily, sometimes dwarf, but not necessarily so. The leaves of the plant of the dry area are usually narrow, often "one-nerved," often very numerous, and as I have noticed both on the dried specimens and in cultivation, frequently of very firm consistency and somewhat curved and twisted. Some of these characters are obviously a response to environment. At the other end of the scale we have the Central Himalayan plant, an Archelirion, with usually thinnish leaves, and these are more or less distinctly 5–7-nerved. The Burmese and frontier specimens are intermediate, inclining most perhaps towards *nepalense* itself. Before we go farther it might be well to inquire whether Franchet was right in assuming *ochraceum* to be of the Martagon type.

L. ochraceum has been in cultivation for the last five years in the Royal Botanic Garden here. At first it did not do particularly well, but in 1920 it came up very strongly and flowered freely. During the five years it has been kept in a comparatively exposed position in the Rock Garden and has received no special attention. The flowers on the first two days of opening tended to keep a trumpet shape, but rapidly after that the perianth segments were completely recurved to as full a Martagon shape as anyone would wish. The leaves were 1–3-nerved, were numerous, and showed a firm consistency with a tendency to twist. Mr. Grove sent me a photograph of a specimen he had some years ago under the name of *L. ochraceum*, showing the early stages of anthesis. He tells me that he thought little of the plant, at that time considering it as a very poor form of *nepalense* and not worth keeping. In his photograph the crowded, twisted leaves are particularly noticeable.

We are now faced with the problem as to whether it is possible to regard this whole series as one species. If I interpret him aright, Mr. Wilson inclines to this view. I admit that I have not, so far, found myself able to draw a dividing line, but, though that may be inconsistent, I cannot reconcile myself to regarding the whole as a unit. Franchet's dry-region Lily is one thing botanically and horticulturally, and the Nepal Lily is another. The Burmese plants certainly form a bridge between the two.

Before going farther, I wish to contrast various specimens with Franchet's type of *ochraceum*. Franchet's type was the plant collected by Delavay at the foot of the Tchang-chan, at an altitude of 3000 metres. I am informed by Mr. Forrest that Delavay's Tchang-chan is the Tali Range quite close to the town of Tali. The flowers of the type are said to be yellow and unspotted. I take Forrest No. 4813, collected on the margins of open and mixed forests on the eastern flank of the Tali Range to be identical with the Paris type. Forrest describes the specimen as a plant of 2–6 feet with fragrant flowers, olive-brown and purple. The purple does not appear in spots, but diffused through the lower inside part of the perianth. The type shows the same colouring. In the Lichiang Range in dry situations

amongst scrub, Forrest found a lily, No. 2869, with olive-yellow flowers, veined and edged maroon; some of the upper leaves are 3-nerved, while the stem is "levissimus" except at the very base. This is obviously conspecific. So also is No. 6465 from the eastern flank of the Lichiang Range, greenish-yellow flowers with crimson markings; also No. 10,879 from the Tong Shan in the Yangtze Bend, a plant of 5 feet, flowers yellow with maroon markings. The two last cited collections have longer and more membranous leaves than the first two and the type. In their shape and consistency they closely approach those of typical *nepalense.*

The above come from a fairly well defined geographical area. The next two show a divergence. They come from the south-west of Yunnan, one from the neighbourhood of Tengyueh from a lava-bed (No. 8930), and one from the Tai-ping-Irrawadi Divide (No. 9080). They are not identical with one another, and neither of them with the type. They exceed the type in robustness. No. 8930 attains 9 feet, according to Mr. Forrest. The flowers are dull greenish-yellow, interior base deep crimson-maroon, and are fragrant as those of the typical series. The chief difficulty is in the papillose scabridity of the stem throughout its whole length. Typical *ochraceum* has the stem "levissimus." The papillose scabridity is present only at the very base of the stem in certain of the plants which I have admitted above as equivalent to Franchet's type. Is this scabridity to be correlated with vigour of growth? In view of the general agreement in other characters, I do not feel justified in giving even a varietal name to this form.

No. 9080 is a stout plant attaining, it is true, only 4 feet, according to Mr. Forrest, but showing very much larger and broader leaves in the upper half and also larger flowers. These Mr. Forrest records as olive-yellow and maroon, and states that they are non-fragrant. The bulb is that of *L. ochraceum* and likewise the leaves in the lower half of the stem. The scabridity is that of No. 8930, though scarcely so pronounced. The upper leaves attain 4 inches and are 3-nerved; the leafy bracts of the inflorescence are quite $\frac{3}{4}$-inch wide and 5-nerved or even

7-nerved. The inflorescence is anything from 1- to 7-flowered. Here is a plant which in the bud condition and also in the flower might well invite confusion with *L. nepalense*. The perianth is recurved from the lower third and is that of a Martagon. The plant has the characteristics which one might expect in a lily of the dry region transferred to a region more influenced by the monsoon rains.

Coming farther west to Upper Burma and the Chinese-Burmese frontier, I find the series represented by three separate gatherings. Forrest collected under No. 18,280, in July 1919, a lily 4–5 feet high with fragrant, olive-yellow flowers, the interior and exterior flushed deep purple. The leaves are of thin texture, very long and narrow, almost grass-like, the stem somewhat scabrid, the perianth large with the segments recurved from below the middle. The second specimen, collected by Forrest under No. 18,378 from the Mekong-Salween Divide, has perfectly smooth stems, very long, thin, narrowly-lanceolate leaves, and fragrant, dull olive-yellow flowers. The third specimen was collected by the late Mr. Farrer on Hpimaw Hill and he, without hesitation, labelled it *nepalense*. Under his No. 1122, he states that it is "common on the open slopes of Hpimaw Hill. The flowers are clear yellow, sweetly scented, with brown-purple centre. It attains 7 feet and handsomely emerges from amidst the bracken." His specimen has long, narrowly-lanceolate leaves of firm consistency, 3–5 nerved, with a flower almost the recorded size of *L. nepalense*, and the perianth segments appear to be recurved from about the middle; the stem is perfectly smooth and shiny. The collection of these three specimens from practically the same area is sufficient to show that we have to deal with a very variable plant and that to suggest names for all these variations is quite unnecessary. The Burman plant collected by Mr. Farrer I cannot distinguish from the Central Himalayan by any distinct character. I have recently had an opportunity of examining again the specimens of *L. nepalense* in the Kew herbarium. In the majority of these the leaves are long and flaccid, but in one of the specimens from Gossain-than, Nepal, the leaves are firm in texture and the flowers 5 inches long.

I now refer to plants collected by Henry at Mengtze Nos. 9320 and 9320A. The specimens in the herbaria of Kew and Edinburgh under these numbers agree with *ochraceum* in bulb, stem, leaf, and flower.

In eastern Yunnan, near Yunnan-sen, E. E. Maire collected a lily (No. 937 in Herb. Edin.) with this description: "Lys bronzé à l'intérieur, rouge sombre à l'extérieur, pétales en volutes extérieures; altitude 2350 m.; très rare." It has glabrous stems, short, crowded leaves of firm consistency, and small flowers with the segments completely recurved to the true Martagon form. It is *ochraceum* as one would expect it to occur in the drier east Yunnan.

Before attempting to sum up the evidence it might be well to look first at the species of this alliance described by Léveillé from eastern Yunnan and Kweichow.

L. Bodinieri, Lévl. MSS. in Herb. Lévl.—Léveillé later reduced his species, incorrectly, to *L. apertum*, Fr., and as such it appears in his Flore de Kouy-Tchéou. His specimens are all referable to the *ochraceum* of dry eastern Yunnan.

L. Feddei, Lévl. in Fedde Repert. Nov. Spec. xi (1912), 303.—Mr. Wilson, Mr. Forrest, and myself have examined the type together and agree that it is *taliense*. The range of this species is thus widened.

L. majoense, Lévl. in Fedde Repert. Nov. Spec. vi (1909), 265, is a form of *L. ochraceum*, Fr.—The flowers are in a very poor state of preservation, but agree exactly with those of *ochraceum*. Some of the leaves are quite typical; others, detached, are very long and flaccid with a very acuminate base.

There is also *L. Tenii*, Lévl. in Fedde Repert. Nov. Spec. vi (1909), p. 263.—This is a puzzling plant. The flowers are quite those of a small *ochraceum*. The leaves of the type are broadly-lanceolate with a very broad insertion, and lack entirely the attenuate-base characters of the whole *ochraceum-nepalense* series. Even in the many variations noted above in the series, I can find nothing quite like the leaves of *Tenii*. Another point, and one, too, noted by Léveillé, is the peculiar resupinate fruit. The fruiting specimens show the leaf-form perhaps even more markedly—some of the leaves having 9–11 distinct nerves.

On the evidence before me I cannot justify the reduction of this species, at any rate meanwhile, to any previously described species. It is a near ally of *ochraceum*. See Plates V., VI.

Of this alliance there remains to be considered only *L. primulinum*, Baker. I have no acquaintance with this species in cultivation, but a recent examination of the type leads me to consider it as a colour variant of the Burmese form of *L. nepalense*. The purplish blotching so characteristic of the rest of the series is here lacking. Like its Burmese relative it occupies an intermediate position between Eulirion and Martagon, as was pointed out by Baker in describing the species.

I shall now try to summarise the foregoing pages. I look upon *L. ochraceum*, Franch., as a good species of the Martagon group extending from the Tali and Lichiang Ranges eastwards towards Yunnan-sen, East Yunnan, and still farther to Kweichow. It also extends into the south-east in the neighbourhood of Szemao and Mengtze. In Eastern Yunnan there is the allied *L. Tenii*, Lévl. *L. ochraceum*, in the experience of the Royal Botanic Garden, Edinburgh, is a hardy lily. At the other extreme of the area of the series is the trumpet-shaped Nepal Lily confined in its typical form to the Central and North-West Himalaya. According to the uniform experience of cultivators this is not a hardy species. In the country running from Tengyueh over the Chino-Burmese frontier into Upper Burma we have a region of great variability of the series contrasting strongly with the comparative homogeneity of *ochraceum* and of *nepalense* in the other areas. The stem may be quite smooth to quite scabrid; the leaves may be linear and grass-like and of very thin consistency, or they may be long lanceolate and flaccid, or broadly and shortly lanceolate and of firm consistency; the flowers show a type of perianth intermediate between Martagon and Eulirion; they may be heavily blotched with purple or they may be quite unblotched as in *L. primulinum*. These variations do not appear restricted to any definite geographical area but intermingle. I doubt whether any of them can be called truly equivalent to the Nepal Lily. I suggest, therefore, the varietal appellation of *burmanicum*

to these variable Burmese plants, retaining also the name *L. primulinum* for the well-marked canary-yellow plant without blotches. The other species of the alliance, *polyphyllum*, *Stewartianum*, and *taliense* are comparatively easily discriminated from the foregoing and from each other.

I submit a key to the species discussed above.

KEY TO THE SPECIES.

I. Martagon type of perianth—completely revolute.	
* Flowers with white ground-colour .	*taliense*
** Flowers with yellow or greenish-yellow ground-colour.	
† Stems always 1-fld. . .	*Stewartianum*
†† Stems usually 2–10-fld.	
‡ West Himalayan species with narrow elongate bulb .	*polyphyllum*
‡‡ Chinese Species.	
§ Leaves with cuneate base .	*ochraceum*
§§ Leaves with rounded base; fruit small, resupinate .	*Tenii*
II. Intermediate type of perianth between Martagon and Eulirion.	
* Flowers heavily blotched inside with purple . .	*nepalense* var. *burmanicum*
** Flowers canary-yellow, unblotched . . .	*nepalense* var. *primulinum*
III. Archelirion-Eulirion type of perianth with segments spreading from the upper third .	*nepalense* var. *typicum*

INDEX TO NAMES RELATING TO LILIUM TALIENSE AND ITS ALLIES.

Lilium apertum, Lévl. in Flore de Kouy-Tchéou, p. 25, nec Franch. =*ochraceum*.

L. Bodinieri, Lévl. MSS. in Herb. Lévl. =*ochraceum*.

L. claptonense, Hort. Low. =*primulinum*.

L. Feddei, Lévl. in Fedde Repert. Nov. Spec. xi (1912) 303. =*taliense*.

L. majoense, Lévl. in Fedde Repert. Nov. Spec. vi (1909), 265. =*ochraceum*.

L. neilgherrense, Collet. & Hemsl. in Jour. Linn. Soc., xxviii (1891), 138, nec Wight. =*primulinum*.

L. nepalense, D. Don in Trans. Wern. Soc., iii (1821), 412. North-West and Central Himalaya.

var. **burmanicum**, W. W. Sm. Upper Burma and Burmo-Yunnan frontier.

var. **primulinum** (Baker). Upper Burma.

L. ochraceum, Franch. in Journ. de Bot., vi (1892), 319. Yunnan, Kweichow.

L. ochroleucum, Wall. MSS. in Herb. Lindl. =*nepalense*.

L. polyphyllum, D. Don in Royle's Ill. Him. (1839), 388. Western Himalaya.

L. primulinum, Baker in Bot. Mag., vol. cxviii (1892), t. 7227. = *nepalense* var. *primulinum*.

L. punctatum, Jacquem. MSS. ex Duchart. Obs. Gen. Lis., 77. = *polyphyllum*.

L. Pyi, Lévl. in Fedde Repert. Nov. Spec. vi (1909), 263. Imperfectly known and altogether doubtful. East Yunnan.

L. Stewartianum, Balf. f. et W. W. Sm. in Trans. Bot. Soc. Edin., xxviii, pt. 3 (1922), 127. West Yunnan.

L. stylosum, Klotzsch. MSS. in Herb. Berol. =*polyphyllum*.

L. taliense, Franch. in Journ. de Bot., vi (1892), 319. Yunnan.

L. Tenii, Lévl. in Fedde Repert. Nov. Spec. vi. (1909), 263. East Yunnan.

II.

The Lilies in Herb. Léveillé.

The following notes deal with the material used by Monseigneur Léveillé for description of his new species and for record of occurrence of previously known species in his floras of Yunnan and Kweichow. Some of it is of very poor quality and does not afford a basis for definite determination. I omit reference to plants in the collection, some correctly named, others not, which have no bearing on the validity of species or on the distribution of the Chinese Lily flora. For purposes of reference I deal with the names in alphabetical order.

L. apertum, Lévl. in Fl. de Kouy-Tchéou, p. 250, nec Franch. E. E. Maire, No. 7454 in Herb. Bonati; pasture land, Tong Tchouan, East Yunnan, 2800 m.

Cavalerie, No. 3006; Majo, Gan-chouen, Kweichow.

This is the basis for record of *L. apertum* in Kweichow. (Flore de Kouy-Tchéou, p. 250.)

All referable to *L. ochraceum*, Franch.

L. Bodinieri, Lévl. in Herb. Lévl.

Type, Cavalerie, No. 3006. See under *apertum*. Léveillé reduced his species to *L. apertum*, Franch. I have found no record of publication of the name.

L. Bonatii, Lévl. in Fedde Repert. Nov. Spec. xi. (1912–13), p. 303.

Type, Maire, No. 7336 in Herb. Bonati. Also collected by Maire at Io-chan and Ta-hai, East Yunnan at 3200–3400 m.

The plant is *Fritillaria cirrhosa*, D. Don.

L. callosum, Sieb. et Zucc. Fl. Jap., p. 86, t. 41.

This is recorded as such in Flore de Kouy-Tchéou, p. 250.

Coll. Emile Bodinier, No. 2440. Environs de Kouy-yang. Bords du ruisseau au bas de la mont de Kien-lin-chan. Fleurs jaune-rouge.

The plant is *L. Henryi*, Baker, which thus extends into Kweichow.

L. Cavaleriei, Lévl. et Vaniot in Mem. Acc. Nuovi Lincei, Roma, xxiii (1905), 372. This is a puzzling fragment. The material consists of one detached flower and a small portion of stem with three leaves, two of these adjoining the inflorescence region. Léveillé's description is too short, and he suggests an affinity with his *L. linceorum*, q.v. It has no connection with that plant. I append the original description:—

"*Lilium Cavaleriei*, Lévl. et Vnt. Sp. nov.

"Differt a praecedente foliis multo rarioribus, longioribus et latioribus, praesertimque flore luteo et profunde lateque aperto, stylo et staminibus perianthio ferme aequalibus.

"Kouy-Tchéou: Gan-pin (Julien Cavalerie)."

In his Flore de Kouy-Tchéou, the record of this lily is subscribed "Sans localité ni indication."

Along with the specimen is a short note forwarded by the original correspondent to Léveillé—by Cavalerie, I presume, although this is not certain.

"Cette fleur est pour vous dire que le lys sec n'est pas le même—ce jaune est je crois assez commun; le rouge que je vous envoie est moins—du moins par ici. Le rouge ne s'ouvre pas non plus de cette façon—il reste un peu fermé et retombe en cloche."

The red lily, I take it, is his *L. linceorum*—

type collected at Gan-pin by Emile Bodinier and L. Martin, No. 1681. It is said to be less common while the odd fragment is fairly so. Mr. E. H. Wilson is of opinion that the latter represents nothing more than a vigorous condition of *L. Davidi*, Duchart. With his opinion I concur.

L. concolor, Salisb. Parad. t. 47, and var. **pulchellum.**

Recorded by Léveillé for Yunnan in Plantes du Yunnan, p. 165.

The plants on which the record is based are *L. Delavayi*, Franch, but see under *L. Mairei.*

L. cupreum, Lévl. in Bull. de Geog. Bot., xxv. (1915), 38.

This is *L. Fargesii*, Franch., not previously recorded from Yunnan. One gathering of E. E. Maire from Ta-choui-tsin, E. Yunnan.

L. Fauriei, Lévl. et Vant. in Fedde Repert. Nov. Spec. v. (1908), 282.

Founded on Faurie Nos. 653 and 2100 in Herb. Lévl. from Korea. The plant is *L. amabile*, Palibin.

L. Feddei, Lévl. in Fedde Repert. Nov. Spec. xi. (1912), 303.

This has been discussed previously under *L. taliense*; see above, p. 134. The plant is *L. taliense*, Franch. The colour of the flower on ticket and in original description is given as yellow, but the writing on the ticket is not Maire's. A second gathering from Io-chan with ticket in Maire's hand says white, spotted red.

L. graminifolium, Lévl. et Vant. in Fedde Repert. Nov. Spec. v. (1908), 283.

The type shows an inflorescence of four very immature flowers. Nakai in Flora Koreana (1911), 258, suggests reduction to *L. callosum*, Sieb. et Zucc., and quite correctly. The bracts show the characteristic callused tips and the unopened flowers are those of *callosum.*

L. linceorum, Lévl. et Vant. in Mem. Acc. Nuovi Lincei, Roma, xxiii. (1905), 371.

The type is Bodinier et Martin, No. 1681, from Gan-pin, Kweichow. There are in addition in Herb. Lévl. several gatherings under this name from E.

Yunnan. They are all referable to *L. Delavayi*, Franch.

L. longiflorum, Thunb. in Trans. Linn. Soc., ii. (1797), 333.

Léveillé records this species in Plantes du Yunnan. His specimens are *L. Brownii*, F. E. Br. var. *Colchesteri*, E. H. Wills. The record of the same species in Flore de Kouy-Tchéou is based on Bodinier, No. 1722, collected near Kouy-yang. This latter is *L. myriophyllum*, Franch.

L. Mairei, Lévl. in Fedde Repert. Nov. Spec. xi. (1912), 303.

A figure in Plantes du Yunnan, p. 166, shows all there is of the type. It does not appear to be anything more than a poor form of *L. concolor*, Salisb.

L. majoense, Lévl. in Fedde Repert. Nov. Spec. vi. (1909), 265.

This is referable to *L. ochraceum*, Franch., and has been discussed under that species. See above, p. 134.

L. mirabile, Franch. in Journ. de Bot., vi. (1892), 313.

Represented in Herb. Lévl. by one gathering of Maire, at Lan-ngi-tsin, E. Yunnan. It accords with *L. mirabile* which is separable from *L. giganteum*, Wall., by characters of dubious value.

L. oxypetalum, Franch. in Journ. de Bot., vi. (1892), 320, nec Baker.

In Herb. Lévl. is a co-type (Delavay 4178). This is *L. apertum*, Franch. in Journ. de Bot., xii. (1898), 220, better referred to *Nomocharis* (see Trans. Bot. Soc. Edin., vol. xxvii. (1918), pp. 291, 296.

L. Pyi, Lévl. in Fedde Repert. Nov. Spec. vi. (1909), 263.

This lily is not in Herb. Léveillé, missing through some mischance. Léveillé places the plant near *L. concolor*, Salisb., but describes the flower as solitary and nodding, while the nectariferous furrow is glabrous; the perianth segments are recurved. The description rather suggests the affinity of *ochraceum* and *taliense*. In the absence of specimens the only course is to leave this as a dubious and imperfectly known species.

L. sempervivoideum, Lévl. in Bull. de Geog. Bot., xxv. (1915), 38.

This is figured in Plantes du Yunnan, p. 166.

Syn. *L. amoenum*, E. H. Wilson MSS. in Herb. Kew. on Henry, No. 10,743 and Hancock 174.

L. yunnanense, C. H. Wright, in Journ. Linn. Soc., xxxvi. (1903), 136, pro parte quoad spec. duo supra citata, vix Franch.

This is a dwarf lily of the Bakerianum-Delavayi group from the comparatively dry eastern Yunnan. Its relationships will be discussed when *L. Delavayi*, Franch., is dealt with (p. 159).

L. Taqueti, Lévl. et Vant. in Fedde Repert. Nov. Spec. v. (1908), 283.

This is represented by two stunted specimens less than a foot high, with unopened flower-buds—Taquet 2101. Nakai in Flora Koreana, p. 257, has suggested reduction to *L. cernuum*, Kom. Mr. Grove, Mr. Wilson, and I agree that the type represents a young stage of *L. callosum*, Sieb. et Zucc.

L. Tenii, Lévl. in Fedde Repert. Nov. Spec. vi. (1909), 263.

This plant has been referred to already in dealing with *L. ochraceum*. See above, p 134. The species is retained as possibly valid.

III.

L. Davidi, Franch., and its Allies.

There has been considerable discussion and confusion with regard to this lily and the species allied to it. Our knowledge of *L. Davidi* is based on very imperfect material. Its story will be found in Elwes' Monograph which contains the original description. The figure there was taken from what Mr. Elwes calls the single and not very perfect specimen. The author suggests that the colour of the lily flower may be brighter than the figure. The points in the description to which I would call attention particularly are :—

Stem slender, green spotted with purplish and covered with pubescent hairs; leaves 60–70, crowded towards the

centre of the stem, linear, having the edges revolute and a single prominent central nerve beneath covered with short hairs; flowers in the only known specimen 3, in colour apparently orange, with numerous purplish spots on their lower half; perianth segments shortly campanulate at the base, very spreading at the points, but not revolute, marked with prominent papillae at their base and remarkable for the presence on the upper side of a median band covered with long, white hairs. The bands are wider on the outer than on the inner segments, and form, in their junction at the base of the perianth, a downy collar.

Franchet in Plantae Davidianae, vol. ii (1888), p. 129, gives a further diagnosis, from which I would quote the following points:—

"Caulis ad apicem usque minutissime scaberulus . . . flores . . . lutei (ex icone citato) dense rubro-maculati.

"Espèce bien caractérisée par ses tiges finement scabres, ses feuilles étroites, allongées-graminiformes à bords repliés en dessous, par ses fleurs velues-papilleuses en dessous sur la nervure. Le *L. Davidi*, de même que l'espèce précédente, ne peuvent guère s'éloigner du *L. speciosum*, Thunb."

I note here that both Elwes and Franchet lay stress on the comparatively slight recurving of the perianth segments and on the remarkable development of hairs on the median line on the perianth segments. Elwes suggests no affinity, while Franchet is inclined to place it along with *L. Duchartrei* not far from *L. speciosum*, Thunb. Elwes is satisfied that the figure represents adequately the imperfect material available, and Franchet makes no suggestion that the same figure is unsatisfactory.

The next stage takes us to Franchet's review of the lilies of China and Tibet in Journ. de Bot., vi. (1892), 308. Here Franchet has gone very much farther into the distinguishing characters of the Chinese lilies. *L. speciosum* he puts aside on account of its glabrous nectariferous furrow. The others of the group we are concerned with he breaks up into three sections, which he endeavours to particularise by colour distinctions. In his first section with white or winey-red flowers he places *Duchartrei*, *papilliferum*, and *langkongense*. In the second section with yellow flowers,

spotted brown, he places *Davidi* and *Fargesii*. In the third section with orange-red or bright red flowers he places *sutchuenense*, *tenuifolium*, *tigrinum*, and *pseudo-tigrinum*. The first of these three sections may stand. The division line between the other two sections is difficult to draw, and I doubt its correctness. We have seen that Elwes judged the colour from the dried specimen to have been orange, while Franchet calls the flowers of *Davidi* "lutei," basing his opinion, if we take the written record, on Elwes' figure, *ex icone citato*. When Franchet came to describe *Fargesii* and *sutchuenense* he separated the former from *Davidi* by its glabrous perianth and by the numerous fimbriate lamellae on the perianth segments. But when he described *sutchuenense* he made no comparison with *Davidi*. I emphasise these points here because they are of moment when we come to deal with *sutchuenense* and *Thayerae*. This is all that is known in herbaria of *L. Davidi* under that name. It has not been in cultivation under that name.

In the original diagnosis of *L. sutchuenense* (Journ. de Bot., vi, 1892, 318) Franchet based his description on plants collected in two distinct areas, some collected by Prince Henri d'Orléans near Tatsien-lou, and some collected by Farges in the mountains near Tchen-keou-tin, also in the province of Szechwan. These were accepted as conspecific until comparatively recently. But for Szechwan plants coming into cultivation the question would probably not have arisen as the types are in the Paris herbarium, and duplicates in other herbaria rare. Seed was sent by the Abbé Farges to M. Maurice L. de Vilmorin. The lily flowered for the first time in 1897, and was recognised as *L. sutchuenense*, Franchet, and so named. A good account is given of it by M. Mottet in Revue Horticole, lxxi (1899), p. 475, fig. 204. Kew received it from Messrs. Vilmorin in 1897 and it flowered in July 1899. It was subsequently figured in the Bot. Mag., t. 7715. A large quantity of bulbs was sent from Szechwan by Mr. E. H. Wilson in 1904 to Messrs. Veitch. These were from Tatsien-lou where Mr. Wilson says they were common, and frequently cultivated by the peasants. That explorer found it growing in great abundance on rocky, grass-clad slopes of the Chino-Tibetan frontier at altitudes from 7000–9000 ft.

The bulbs are cooked and eaten by the Chinese. Once in cultivation this plant was also named *L. sutchuenense*, Fr. Those who had both plants in cultivation were divided in opinion. There were some who were satisfied to regard the two as the same species while others demurred.

Thus, in the "Gardeners' Chronicle," 16th August 1913, 3rd series, vol. liv, Mr. Grove writes:—

"When both lilies are cultivated under identical conditions, the typical *sutchuenense* of Franchet is seen to be a comparatively dwarf and delicate plant with slender, dark-coloured stem, now and again perhaps a yard high, but commonly a couple of feet or less. A reference to fig. 46 shows that it is but sparsely leaved—an important point—and not floriferous; in point of fact, though five or more flowers have been recorded in cases where this lily has been highly cultivated, it is usually content with three. The mature bulb is small—about the size of a peewit's egg—and the stem, which is only slightly pubescent, has a curious way of creeping about under the earth before pushing through (see fig. 45), a peculiarity it shares, so far as is known at present, only with *L. Leichtlinii*, *L. neilgherrense* and *L. philippinense*.

"The lily collected by Wilson, on the contrary, far from being a pigmy, is a fine upstanding plant from 4 to 4½ ft. high and very floriferous; in fact, in ordinary seasons and without the stimulus of any special cultivation, it will usually carry at least sixteen or seventeen blooms. These are borne on pedicels a good deal longer than those of the true *L. sutchuenense*, and, though the point is not of importance, the pedicels are a different colour. The stem is green, and as often as not is noticeably covered by minute white hairs after the fashion of *L. tigrinum Fortunei*; it is clothed as densely as *L. pomponium* with long linear leaves, and this is the most characteristic feature of the plant; the stem rises straight from the bulb, which is from 2–2¼ ins. in diameter, ivory in colour, and not at all unlike a small edition of *L. tigrinum*."

Can this have been *L. Willmottiae*?

Shortly after the issue was definitely raised by Mr. Wilson when he published a description of *L. Thayerae* in

Kew Bulletin, 1913, p. 266. There he distinguishes his species from *L. sutchuenense* by the rigid stem densely and shortly hispid, white-bearded in the leaf-axils, leaves linear-oblong, with scabrid, revolute margins, flowers in a lax pyramidal raceme and by the villose buds. Mr. Wilson splits up what he considers is Franchet's composite type, placing Prince Henri's plant under *Thayerae* and leaving Farges' plant as *sutchuenense* as the one first cultivated in Europe and figured as *sutchuenense*. It should be noted that Franchet quotes Prince Henri's plant first in his diagnosis. Franchet's description is more or less applicable to both gatherings, and in any case Franchet considered the two conspecific.

The plant or plants concerned here are not restricted in distribution to the province of Szechwan. Under the native name of Hong-pei-ho a lily is widely cultivated throughout Szechwan and all parts of Yunnan—brought also into certain of the provinces to the east of these two. The cultivation of the plant spells trouble. The difficulty arises with many Chinese plants apart from Lilium. An article of food ranging in cultivation through so wide an area would be sure to show race variations, and would certainly vary in size of bulb, rigidity of stem, and inflorescence. As regards size of bulb, vigour of growth, form of inflorescence, and especially villosity, Forrest noted in the field great divergences in what he judges to be the same plant. His specimens support his view, but on his present expedition he promises to collect more fully with a view to obtaining conclusive evidence.

Mr. Wilson tells me he has come to the decision that his *L. Thayerae* is equivalent to *L. Davidi*. This acute observation has much to commend it. We have seen that *Davidi* was based on very slight material; the foliage in the two is very similar, the slight recurving of the perianth segments is probably due to imperfections in the drying of incompletely opened flowers (I have similar stages in more than one of Forrest's Yunnan plants of this series); the colour of dried *Davidi* was orange to Mr. Elwes' eye, and, most important of all, the very remarkable villosity of the bud which persists frequently in the fully opened flowers is one of the characters employed by Mr. Wilson to mark

out his *Thayerae*. This reduction would also explain why *Davidi* has never been found again since the first gathering. Specimens have been referred either to *sutchuenense* or *Thayerae*. Franchet was so impressed by the character of the perianth segments and by the villosity that he made no comparison of *Davidi* with his new species *sutchuenense*. In requesting the loan of the type specimens of Chinese lilies from Paris I fell into the same error. I did not think it necessary to borrow the type of *Davidi* since from Elwes' illustration it seemed so completely distinct from any of the other Western Chinese lilies in its villosity. Through the kindness of Professor Lecomte I have been able to rectify this and have examined the specimen on which the plate of *L. Davidi* was based. The specimen is far from good, but the artist in Elwes' Monograph has done his best. The accompanying plate will show its present condition. There is no doubt in my mind that it is the original. It has had three flowers and many leaves. Hairs are present on some of the leaf-axils. The legend runs thus:—

"Lilium an nova species (?) insignis caule scabro, foliis linearibus margine revolutis, flore luteo (?) intus abunde maculato, extus in medio lanato (note de M. Duchartre). Recolté parmi les grandes montagnes qui separent Moupin du Setchuan, en juillet 1869 A.D."

Elwes' Monograph gives:—"Tibet orientalis, territorio 'Manze' dicto, alt. 9000 ped." The month quoted is June 1869, but as the Abbé brought only a single dried specimen of this lily, both accounts are referable to it.

The examination of the type confirms Mr. Wilson's surmise—*Davidi* and *Thayerae* are equivalent.

I must now revert to consideration of Franchet's type specimens of *sutchuenense*. Prince Henri's specimen shows no bulb; the stem is somewhat slender, densely and finely scabrid; the leaves narrow, linear, and grass-like, crowded, with tufts of whitish hairs at the base of some of the leaves; the perianth appears to have been orange with dark spots; the flower is fully expanded and shows no remains on the outer median line of any villosity. I have before me two sheets of Farges, No. 186. One shows a bulb from which the stem arises direct without any inter-

vening rhizomatous portion characteristic of the plant noted by Mr. Grove in "Gardeners' Chronicle," 16th August 1913, 3rd series, vol. liv.; the stem shows the same scabridity as Prince Henri's plant; the leaves of this plant lack the white tufts, but are otherwise similar; the flowers of which there are two fully developed with remains of other two are likewise similar; the fully expanded perianth segments show no remains of villosity. The second specimen of No. 186 has no bulb; the scabridity is very faint; the leaves similar in form and consistency show traces of the white tufts; the inflorescence is ample, showing nine fully developed flowers with remains of one or two undeveloped. They agree with the flowers of the previous specimen, and show no villosity at this stage. The differences noted between the plants of these three sheets are all practically negligible. I think Franchet's *sutchuenense*, as based on these three,[1] is distinctly one species and not two. I cannot bring the discriminating characters used in the description of *L. Thayerae* into harmony with Prince Henri's plant. The stem is if anything less rigid than in No. 186. It is equally scabridulous; No. 186 shows traces of the white beards in the axils; I can see no difference in the leaves; there is only a solitary flower. There is no trace of villosity in the flower, whatever it may have shown in the bud. The description of *L. Thayerae*, however applicable to other specimens from Szechwan and Yunnan, does not fit in with what Franchet had before him. The three sheets are conspecific, and Franchet's *sutchuenense* is a unit. I should note here that if Farges, No. 186, were left as the type of *sutchuenense* then the plant noted by Mr. Grove in "Gardeners' Chronicle," 16th August 1913, vol. liv., p. 114, fig. 45, is not equivalent. No. 186, as already noted, has a moderate-sized bulb from which the stem arises straight, while the leaves are crowded, not sparse. If the lily named *sutchuenense* in that article is a good species it is not *L. sutchuenense*, Franch. The lily with which it is contrasted is what was named later *L. Thayerae*, and now *L. Davidi*. But the characters given

[1] These three do not represent all the Paris material. I can speak only of what I have seen. Mr. Wilson tells me in a letter from Paris that he finds some of the material to be his *Willmottiae*.

in favour of the specific distinctness of this lily (in plate 45) do not impress me in view of what follows.

I bring in here some observations on the plants of this series collected in Yunnan by Forrest and others as they form an interesting corollary. Forrest collected "Pei-Ho," a plant of 2½–6 feet, with orange-scarlet flowers with crimson markings in the Lichiang Valley (No. 6391). He notes that it is cultivated by the Chinese and natives who use the bulb as an article of diet. The flowers and buds of these specimens show distinct but not copious villosity along the median line of the perianth segment. The villosity obviously tends to be easily deciduous. Mr. Wilson has noted this specimen as *L. Davidi*. On Forrest, No. 8429, collected in the Mingkwong Valley, Forrest notes the flowers as deep salmon-red, spotted deep purple-lake. He finds it on dry, open situations amongst rocks, undoubtedly wild on the hills, but cultivated by the inhabitants of the Tengyueh and adjacent valleys for the bulb which is sold as an article of food under the name of "Pei-Ho." The specimens are from 1- to 4-flowered; the bulb is on the small side; one of the buds shows a villosity comparable to the figure of *Davidi* in Elwes' Monograph. This is also named *Davidi* by Mr. Wilson.

No. 4814, collected in the Tali Valley, named *Davidi* by Mr. Wilson, has a many-flowered inflorescence; the buds and flowers are almost glabrous, but there are indications of villosity on some of the perianth segments.

No. 14,663, collected on the Mekong-Salween Divide on open rocky slopes and on cliffs, is a wild specimen; the bulb is missing, but there is an indication of a certain amount of rhizomatous growth before the development of the stem exactly comparable to the figure attached to Mr. Grove's paper referred to; the leaves are crowded, well-bearded at the axils; they, moreover, show the scabridity which is noted in the description of *Thayerae*; the buds are glabrous. I call attention to this specimen as illustrating how this wild form touches both *Thayerae* and *sutchuenense* as described.

A plant collected by Monbeig in 1907, No. 264, and probably wild, shows a rhizomatous growth, but a very scabrid stem; the leaves are crowded and somewhat

scabrid; the buds are almost glabrous. We see here again a blending of the characters of *sutchuenense* and *Thayerae*. Other collections show the same variations. Forrest, 2803, from the Lichiang Range, likewise named *Davidi*, shows slightly scabrid leaves and faint villosity on the perianth. Forrest, No. 494, from grassland on the shores of Lake Las-Hsi-pa, Yunnan, named *Davidi* by Mr. Wilson, shows the same small bulb, a distinct rhizomatous prolongation, flat, linear leaves which cannot be called scabrid, while the single flower shows no remains of villosity. It is, however, rather far developed. Here again we have the same blending of characters. From Eastern Yunnan we have Maire, 2658, which would pass for a typical *Thayerae*, except that the leaves are not scabrid, while the flowers have shed their villosity if they ever had it.

I have given these details perhaps at some wearisome length. I shall now try to summarise the foregoing:—

1. *L. Davidi*, Duchart. ex Elwes, was described from imperfect material, and too much stress laid on its very slightly revolute perianth, its villosity, and its colour. Franchet consequently did not think of contrasting it with his *sutchuenense*.

2. Mr. Wilson identifies his *Thayerae* with *Davidi*. This decision on the evidence I would accept.

3. *L. sutchuenense*, Franch., is a unit as regards the specimens cited by the author and not divisible into *sutchuenense* and *Thayerae* (i.e. *Davidi*).

4. *L. Davidi* (including *L. Thayerae*), not uncommon in the wild state, is a widely spread, cultivated lily showing many divergences in habit and in villosity. Typical *Davidi* shows pronounced villosity and little or no rhizomatous growth. But it varies to forms with glabrous perianth and creeping rhizome.

5. The form with glabrous perianth is the lily called *sutchuenense* by Franchet. This is not more than at most a variety of *Davidi*.

6. *L. Davidi* is consequently a variable lily including *Thayerae*, E. H. Wilson, and *sutchuenense*, Fr., these two forms showing a transition from marked villosity to glabrousness in the perianth.

7. As we have seen in the Yunnan specimens rhizomatous development may or may not appear. The lily in fig. 45 in "Gardeners' Chronicle" (16.8.1913), 3rd series, vol. liv., named *sutchuenense*, cannot be taken as exactly equivalent to the *sutchuenense* of Franchet, the original types of which lack rhizomatous development, but show crowded leaves and an inflorescence which is sometimes many-flowered. As I have never seen this form in cultivation, my opinion is given with reservations, but I would regard it as simply a growth form of *Davidi*, certainly more akin to the glabrous perianth state of that species (*sutchuenense*) than to the more villous state which was described as *Thayerae*.

The whole of the *Davidi* group invite comparison with the Maximowiczii and Tigrinum series from northern and eastern Asia, which appear to be parallel developments, but my acquaintance with these eastern lilies is too slight to give any value to my opinion thereon. Nor have I material to justify reference to *L. Biondii*, Baroni, *L. chinense*, Baroni, or *L. Rosthornii*, Diels.

L. Fargesii, Franch., is a member of the series, but is quite distinct from the foregoing. Franchet bracketed it with *Davidi* by colour distinctions, calling the two yellow spotted with brown as opposed to the orange-red or bright red of the other species of this group. We have seen that as regards *Davidi* this colour distinction will not hold. There is more to be said for the colour distinction as regards *Fargesii*. The plant is not in cultivation and it is difficult to be sure from dried specimens of the true colour. But to judge from several sheets which I have on loan from Paris, the colour would not appear to be a bright orange. It has a very much smaller flower than its allies, and its sparse, long, linear leaves also distinguish it. Franchet also called attention to the number of lamellae on the inner face of the segments, noting them as 4–6 in number. This seems to hold good. The lily occurs also in eastern Yunnan—*L. cupreum*, Lévl., is the same. It has the lamellar characters which Franchet observed, and on Maire's original ticket the colour is said to be "cuivré," which is additional evidence of colour distinction between this lily and *Davidi* and its forms.

There remains *L. Willmottiae*, Wilson, of which I have not seen the types. The plant comes from Hupeh. All specimens I have seen of this species are from cultivated plants. These do not agree with the original description, as the stem is certainly not weak and the leaves are 1-nerved instead of 3-nerved. I believe the plant before me, which was cultivated in the Royal Botanic Garden, Edinburgh, to be a form of *Willmottiae*. None of the characters noted in the diagnosis are individually very strong as regards specific distinction, but the sum of these characters seems to warrant the retention of *Willmottiae* as a distinct species.

IV.

L. Duchartrei, Franch., and its Allies.

The lilies concerned in this group are:—

L. Duchartrei, Franch.; *L. papilliferum*, Franch.; *L. lankongense*, Franch.; *L. Forrestii*, W. W. Sm.; *L. Farreri*, Turrill.

Franchet had the first three species in that group of Chinese Martagons which he characterised by their having papillose lamellae bordering the nectariferous furrow. He subdivided this group by colour distinctions and the three species noted were placed together as having flowers either white, spotted with brown, or flowers of a winey-red tint.

L. Forrestii, W. W. Sm., appears in Notes of the Royal Botanic Garden, vol. viii, p. 192 (1914), and was described as akin to *L. Fargesii*, Franch. *L. Farreri*, Turrill, appeared in "Gard. Chron.," 3rd series, vol. lxvi, p. 76 (9.8.19), and was described as akin to *L. Duchartrei*, Franch.

I have examined in detail the type sheets from Paris of *L. lankongense*, Franch. (Delavay, n. 4437) from Lankong, Yunnan. Franchet in his description lays stress on the fact that the stem is covered with leaves to the base, which character he states is very rare among the lilies of this group. This is a very slender character on which to base specific distinction and would require to be supported by other characters. I understand from Mr. Forrest that the Lankong area, which he has himself visited, is a very arid region, consisting geologically of limestones and sand-

stones principally. *L. lankongense* is in the type sheet very much dwarfed. The characters of the bulb and rhizome, of the leaves, and of the details of the flower correspond very closely with *L. Duchartrei*. The presence of leaves towards the base of the stem seems to me to be conditioned by the absence or sparse production of other plants or herbage in the vicinity. Mr. Forrest, Mr. Wilson, and I have examined the type together and agree that it represents nothing more than a dwarfish state of *L. Duchartrei*, Franch.

When I named *L. Forrestii* I had, as I thought, no adequate material of *L. Duchartrei* available and I laid undue stress on the yellowish-rose ground-colour. Mr. Wilson, who examined the types, gave it as his opinion that it is also a form of *Duchartrei*. The leaves are shorter and broader than what obtains in typical *Duchartrei*, but Mr. Wilson is right, and I accept the reduction. It is only a form of that species at most and not worthy of even a varietal name.

L. Farreri, Turrill, was collected by Mr. Farrer in Kansu in 1914 under No. 183. No dried specimens of it were sent home by Mr. Farrer. The plants were grown in this country in several places from seeds forwarded by Mr. Farrer. When Mr. Farrer first found it he was remote from books and thought that he had possibly stumbled on the *L. Davidi* of Elwes' Monograph. I quote from "Gard. Chron.," 3rd series, vol. lvii, p. 1 (2.1.15), what he says of it:—

"All the banks are aflame with the scarlet of *Lilium tenuifolium* amid mounded lavender masses of a very delightful *Aster* of *acris* relationship, which always forms into a neat round dome, and flowers simultaneously in such profusion that you can see its crowded blobs of lilac from far away on the green hills, amid the fiery haze of the lilies. There is another lily, too, but this is rarer, and begins only at higher elevations, in a more limited district. It haunts cool mountain slopes and river banks amid the coppice. I cannot perfectly recall the figure of *L. Davidi* (which I incline to believe this lily to be), or I could be more certain as to what is, or is not, the name of this. *L. Davidi* on its recent introduction was hailed as a

disappointment by comparison with the seductive plate in Elwes' Monograph; but this dainty lily could surely not be despised by anyone. With broader, clear-green leaves, it is a match in habit for *L. tenuifolium*, as that species grows here, noble and dainty, far ampler and more splendid than it is often seen in England. It attains some 15 inches in height, and carries one, two, or three pendant Martagon flowers of a cold ivory or paper-white, waxy in texture, and freckled rather unnecessarily with maroon along the inner margins of their segments. The flowers are larger and fatter than those of *L. tenuifolium*, and I find it an attractive beauty, as it hangs glacial and pure amid the scrub. Its site, soil, and habit suggest little difficulty in its culture. But it can never have the brilliancy of *L. tenuifolium* as the Thibetans grow it; for they ram a handful of bulbs at haphazard into the hard mud of their flat roofs, and there above the eave sprouts a living pyramid of fire from year to year."

The bulbs received by the Royal Botanic Garden, Edinburgh, grew well and produced a lily which was figured, and the figure was sent to Mr. Grove for his opinion. Mr. Grove identified it as *L. Duchartrei*, Franch. It had a white ground-colour suffused with rose, and the white hair tufts in the axils of the leaves were more or less absent. With its identification as *L. Duchartrei* I am quite in accord. Plants believed to be of the same gathering were cultivated by Mr. F. C. Stern, at Goring-by-sea, Sussex. I have a figure made from a fresh specimen of this lily. It corresponds closely to Mr. Farrer's description of a cold ivory-white, and the leaf axils are conspicuously white-bearded. The flowers seem to be somewhat smaller than usual in typical *L. Duchartrei*. Unless Mr. Farrer erred in the field, we have only one lily to deal with. The colour differences are at most only varietal. The tufts of hairs in the axils occur in several series and are not constant. In any case the Paris type of *L. Duchartrei* shows these hairs. The small size of the flower in *L. Farreri* would appear to be due to cultural conditions. I cannot see more in *L. Farreri* than a form of *L. Duchartrei* at most. In this conclusion Mr. Grove and Mr. Wilson concur.

We are now left with only two distinct species of the series, *L. Duchartrei* itself and *L. papilliferum*.

L. Duchartrei is recorded from Moupine in Szechwan (coll. David); from Tatsien-lou (coll. Prince Henri d'Orleans); from Kansu (coll. Farrer); among the Yunnan records are Mo-so-yn (coll. Delavay, n. 3983); Lankong (Delavay, n. 4437); Hee-chan-men (Delavay, n. 2559). These two records appear under *lankongense* in Franchet's description as does also Mo-so-yn in the woods of Koutoui (Delavay, n. 3797), which is the exact locality given by Franchet for one of the records of *L. Duchartrei*. Further Yunnan records are Chungtien plateau (Forrest, No. 496), previously reported in Notes Roy. Bot. Gard., vol. vii, p. 38 (1912), as *L. papilliferum*, Franchet; Lichiang Range (Forrest, No. 2692), also previously recorded as *papilliferum*, op. cit., p. 154; Lichiang Range (Forrest, Nos. 6224 and 6582) under *Forrestii*; mountains in the north-east of Yangtze bend (Forrest, No. 10,637); Mekong-Salween Divide (Forrest, No. 14,238); Doker-la, Mekong-Salween Divide (Forrest, No. 16,730); north-west Yunnan, near Tsekou (Monbeig, 263).

The species consequently extends throughout the alpine areas in the west of the provinces of Kansu, Szechwan, and Yunnan. Under *L. polyphyllum* in Elwes' Monograph there is a suggestion that that species extends east to the frontiers of China and Tibet. The plant Mr. Elwes had in view was no doubt *L. Duchartrei*, at the time unnamed. Apart from bulb characters *L. polyphyllum* is readily distinguished by the glabrous sulcus.

Franchet distinguishes his *L. papilliferum* from *Duchartrei* by the narrow leaves, by the papillose villosity of the stem, and by the colour of the flowers. These are all in this instance satisfactory characters. Forrest collected the species in the mountains west of Feng-kou (No. 12,984); on the Kari Pass, Mekong-Yangtze Divide (No. 13,006); on the Mekong-Salween Divide in Lat. 28° 10′ N. (No. 13,412). These specimens are quite in accord with Franchet's types. Forrest gives the colour as deep crimson, or dull crimson, or deep crimson-maroon. Mr. Forrest notes further that it is cultivated by the Chinese. His own specimens were obtained from ledges of cliffs or

on stony pasture. In the development of its bulb it is very similar to *L. Duchartrei.*

V.

L. Bakerianum, Coll. et Hemsl., and its Allies.

We have in this group a good illustration of the overlapping in nomenclature which has resulted from the more or less contemporaneous description some thirty years ago of Yunnan species at Paris and Burmese species at Kew. Geographically the two areas are continuous and the flora has much in common, especially in genera where there tends to be a wide distribution of individual species as is the case in *Lilium.* The Burmese representatives are *L. Bakerianum* and *L. Lowii.* The species described by Franchet which pertain to this group are *L. Delavayi* and *L. yunnanense.* Franchet in his key, Journ. de Bot., xii (1898), 308, associated with these two the following:—*L. formosum, L. myriophyllum,* and *L. concolor.*

The last mentioned has little in common with the group and may be at once left out. Although placed by Franchet among the lilies with perianth "regulièrement évasé de la base au sommet," *formosum* and *myriophyllum* have their affinity in the *longiflorum-Wallichianum* series and need never be confused with the *Bakerianum* group. *L. Henrici,* Franchet, Journ. de Bot., xii (1898), 220, is stated by its author to be near *Delavayi*:—

"Le *L. Henrici* peut-être placé au voisinage du *L. Delavayi,* dont il diffère bien nettement par la coloration de ses fleurs, ses longs pédoncules et ses feuilles allongées, très rapprochées sur la tige."

Allowing that *Henrici* is correctly referred to *Lilium,* it has no close connection with the *Bakerianum* series, but in point of fact as regards habit and structure of the flower it comes very near to *Nomocharis* of which genus it may be a member. There is also *L. linceorum,* Lévl., which as I have shown is only *Delavayi* (*supra,* p. 139). Finally there is *L. sempervivoideum,* Lévl., which has claims to specific distinctness. There are consequently five lilies for comparison within the *Bakerianum* group:—

L. Bakerianum, L. Lowii, L. Delavayi, L. yunnanense, L. sempervivoideum.

The history of the description of the first four shows an interesting parallel. *L. Bakerianum*, Coll. et Hemsl., was first published in Journ. Linn. Soc., xxviii (1890), 138, pl. xxii. It is described as having white flowers and remarkable for the short genitalia. No particular affinity is given unless in the note that it is "intermediate in character between *L. davuricum*, Gawl., and *L. japonicum*, Thunb."—a comparison which it is difficult for me to appreciate. In May 1892, in Bot. Mag., t. 7232, appeared *L. Lowii*, Baker. It was contrasted with *nepalense* and *Bakerianum*. The latter is said to differ in the erect flowers, shorter stamens, and inner segments of the perianth much broader than the outer. The perianth showed "reddish-purple" or "claret-brown" spotting on the lower inside half of segments. When these Burmese lilies were in cultivation (along with *sulphureum* and the Burmese form of *nepalense*) they attracted attention, among other points, by their variability, especially in colour. Thus amid several references in horticultural literature I quote from Mallett in "The Garden," vol. lxiv (1903), p. 333:—

"*Lilium Bakerianum* (Collett and Hemsley), syn. *L. Lowii* (Baker), Professor Baker's Lily. A recent and valuable addition to our garden lilies, though known long ago. Very distinct in the shape and colouring of its flowers. Bulbs 4 ins. in circumference, white, purplish when exposed, globose, very fibrous, roots stout and of several years' duration. Stems very slender, smooth or slightly rough, 3 ft. long, bearing one to three bulbils and a few roots at their bases. Leaves mere bracts below, largest (3 ins. long) at the middle of the stem, dark glossy green, rough beneath, lance-shaped, scattered, ascending. Flowers two to five in a loose umbel, horizontally poised or drooping, trumpet shaped, 3 ins. across, 4 ins. long, white, spotted brown low down the distended funnel, coloured greenish externally, especially on the midribs; the petal tips slightly recurve, and the anthers are yellow; very variable. Flowers in July. The Burmese forms are mainly smooth-leaved, and the Yunnan forms rough on the under

side. We have seen specimens heavily spotted with claret nearly up to the petal tips, and others scarcely at all spotted and with a faint lilac flush at the throat. A few only are fragrant. Inhabits varied sites on high mountain ranges 4000 ft. to 6000 ft. above sea-level. Upper Burma and Yunnan. Its suppressed leaves at the base of the stems indicate association with scrub."

Doubts arose as to the specific distinctness of *Lowii* from *Bakerianum*. The general trend was to regard it as a variety at most. Yunnan plants were mentioned as the same but without reference to any distinct species of Franchet. The latter's diagnoses of *Delavayi* and of *yunnanense* appeared in September 1892 (Journ. de Bot., vi, p. 314). *Yunnanense* appears first and is compared with *japonicum*, Thunb., as regards the flower. *Delavayi* on the same page has its flowers contrasted with *candidum*. Even in the key, *op. cit.* 308, the two species are not so placed as to suggest comparison except as regards colour distinctions. *Yunnanense* is placed among the species with flowers white or tinted violet on the exterior. *Delavayi* among "rouge cocciné ou lie du vin presque toujours maculées de brun ou de noir." It must be said for Franchet that in the type specimens there is no immediate suggestion of proximity, but the access of ampler material of these lilies has brought forms which bridge the gap between the two. *Yunnanense* occupies the place of *Bakerianum*, while *Delavayi* has a very close connection with *Lowii*. We have consequently in Burma the white *Bakerianum* giving at the extreme the deep spotted or tesselated *Lowii* and in Yunnan the white *yunnanense* extending to the olive dark-spotted *Delavayi*.

Forrest has collected *yunnanense* in Yunnan several times:—

Mountains in the north-east of the Yangtze bend, flowers pure white, minutely speckled maroon on basal half interior, fragrant, No. 10,545; Kari Pass, Mekong-Yangtze Divide, flowers white, faintly tinged rose on exterior, No. 12,977. (This is a remarkable gathering in its variations; the largest plants are 2 ft. high with white flowers 3 ins. long; there are also plants of 1 ft. high with rose-tinted, speckled

flowers 1½ in. long and leaves densely scabridulous below; also half-developed plants of 6 ins., with crowded leaves yet with flowers almost fully open. Forrest made sure on the spot that these were all conspecific. A study of the specimens under this number shows conclusively how easily specific names could be attached to forms of this lily—and with apparent good reason, had not the series been carefully examined in the field); also in mountains east of Yung-ning, flower white, fragrant, No. 16,934. All these sheets I had named as *yunnanense* and they conform to Franchet's type. Mr. Wilson has marked them *Bakerianum*, implying that he considers Franchet's species equivalent to *Bakerianum* which was described two years earlier. On the evidence both botanical and geographical this reduction I accept. Henry's No. 13,026 from Szemao, flowers white, is the same; it was identified as such by Wright in Journ. Linn. Soc., xxxvi (1903), p. 128. Henry, No. 10,774, from Mentze, pinkish flowers, is also the same.

Conspecific with Franchet's types of *Delavayi* are Forrest, No. 10,317, from the Lichiang Range, very heavily spotted to the tips of the perianth segments; No. 8499 from lava bed west of Tengyueh, flowers dull olive-green, spotted reddish-purple; No. 1893 from the Tali Range, pale greenish-yellow, spotted on interior crimson; No. 2433 from the Lichiang Range, olive-brown, spotted deep purple; No. 5824 from the Lichiang Range, olive-brown, spotted crimson; No. 7137 from Tali Range with eight flowers, deep brownish-olive, spotted maroon. Maire, Nos. 2221, 2654, from Yunnan-sen and Léveillé's type of *linceorum* are also referable here. There is much variation in the spotting, some having so little as to approach *Bakerianum* and certainly to touch *Lowii*. The style varies much in length, sometimes twice the ovary as in Franchet's description, sometimes more or less equal to it. This is not by any means due to changes in the process of anthesis.

Are all these lilies to be regarded as simply modifications of one variable species? Mr. Wilson has referred all the Yunnan *Delavayi* to *L. Bakerianum*, Coll. et Hemsl. var. *Delavayi*, Wils. *L. Lowii* is probably nothing but a spotted form of *Bakerianum*, but the ground-colour is still white with a suggestion of green on the outside.

Franchet's types (rubro-vinosi) and Forrest's specimens (olive, olive-brown, dull olive-green) are consistent in their avoidance of white, while *yunnanense* is always in Forrest's experience pure white (tinged sometimes with rose). Mr. Forrest was at one time of the opinion that *Delavayi* showed no refraction of the segment tips, but in photographs afterwards obtained by him *in situ* there is a recurving similar to what is found in *Bakerianum*. His experience in the field of what have been termed *yunnanense* and *Delavayi* led him to the conclusion that the two are distinct from one another. Accordingly my inclination is to keep *Delavayi* as a species closely allied though it may be to *L. Bakerianum*; to regard *yunnanense* as equivalent to *L. Bakerianum*; to consider *Lowii* as a spotted variety of *Bakerianum* on the way towards *Delavayi*. I am, however, not at all sure but that *Lowii* represents most forms of *Delavayi*, and as *Lowii* was described first that name would have precedence. But the name *Delavayi* represents the olive lily of Yunnan with dark spots, and while the doubt remains, that name is on the whole more worthy of retention. There is still *L. sempervivoideum*, Lévl. The original description in Bull. de Geog. Bot., xxv. (1915), 38, is appended.

"Insignissimum bulbo plurisquamatum; squamis omnino liberis lanceolatis confertissime rosulatis, erecto-patentibus, folia graminea conferta 1–2 mm. lata curta; flos unicus raro geminus albus, nutans, intus rufo vel rubro punctatus.

"Yun-Nan: collines rocailleuses ou herbeuses de ou en face de Siao Ou-Long, juin-juill. 1911 et 1912 (E. E. Maire)."

There is ample material of this in Herb. Lévl. Henry, No. 10,743, from Mengtze, with pink flowers may be considered along with it; it was named *yunnanense* in Journ. Linn. Soc., xxxvi. (1903), 136. It differs from Franchet's description and types in (1) the stem being smooth and not scabrid, (2) leaves scarcely tri-nerved and not scabrid on the veins, (3) flowers pink and only 4–5 cm. long, (4) the style is twice the ovary. To this in Herb. Kew., Mr. Wilson has affixed the name of *L. amoenum*, Wils., but after seeing Léveillé's type of *sempervivoideum* decided it was equivalent. There is also in Herb. Edin. two gather-

ings of Maire from the vicinity of Yunnan-sen, Nos. 1302, 2238, with no legend save "Lys rouge—hautes cimes." This is the same plant.

The type needs ampler description:—

The bulb and rhizome is that of *L. yunnanense* (*Bakerianum*). Stem slender, about 30 cm. high, glabrous, but *sometimes* finely scabridulous; leaves linear, crowded, 4–5·5 cm. long, about 2 mm. broad, 1-nerved, sometimes faintly 3-nerved, glabrous, or at times with a fine scabridulous early deciduous indumentum—reminiscent of that of *yunnanense* but much finer. Flower 1–3, usually solitary; 3–4 cm. long; perianth similar otherwise to *yunnanense*; style 2 times the ovary. In Maire's Yunnan-sen specimens the colour of the flowers is much deeper and the style equals three times the ovary. In Henry, 10,743, the leaves are a little larger, up to 6 cm. but much broader (up to 6 mm.), and are much less crowded. But it is the same lily. Its close affinity to *yunnanense* (*Bakerianum*) is undoubted. It is what *yunnanense* might be expected to be in the comparatively dry, sub-arid East Yunnan. Only Henry, No. 10,774, shows that *Bakerianum* more or less typical is also at Mengtze. The sum of the differences between *sempervivoideum* and *Bakerianum* are, however, sufficient for specific distinction. I quote Maire's three original tickets as Léveillé gave an abbreviated statement of these.

"Lilium bulbeux; (rare) fl. blanches, pointilles de rouge à l'intérieur; rochers en face de Siao-ou-long. Alt. 2550 m."

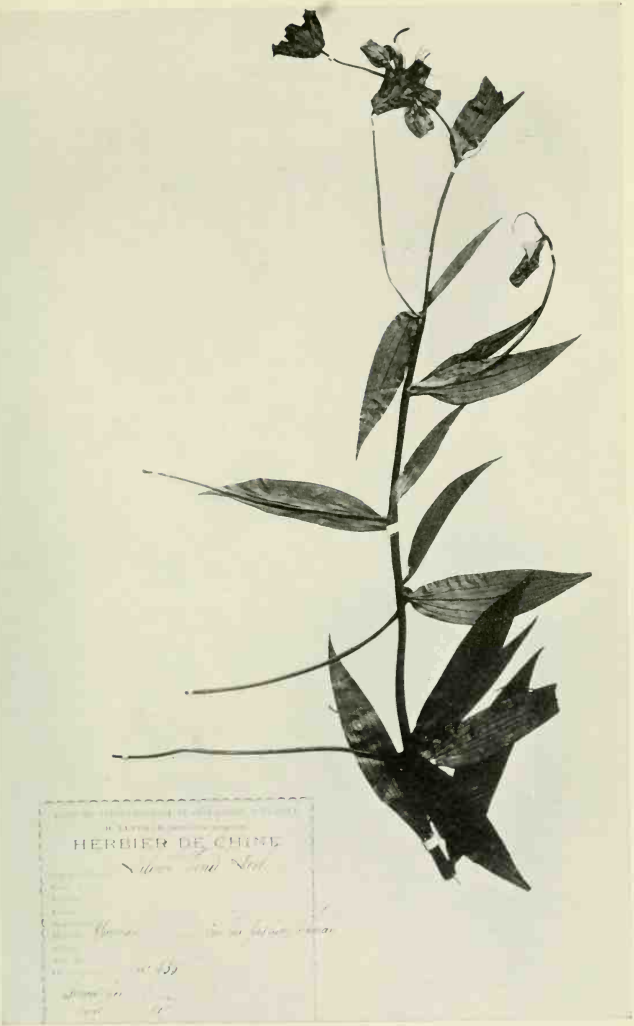
"Lilium bulbeux; fl. blanches-penchées; collines herbeuses de Siao-ou-long. Alt. 2550 m."

"Lilium bulbeux; fl. blanches, penchées, pointillées de roux en dedans; collines rocailleuses de Siao-ou-long. Alt. 2600 m."

The colour of the flower varies from white to a deep pink.

Lilium Stewartianum, Balf. f. et W. W. Sm.

W. W. Smith.

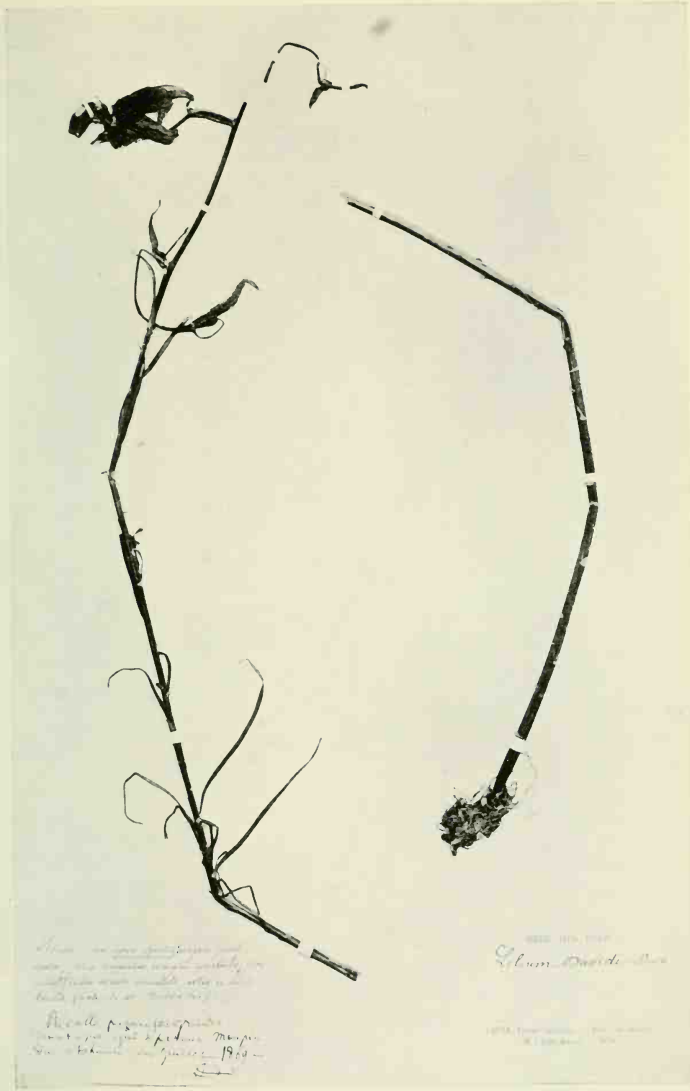


Lilium Tenii, Lévl.

W. W. Smith.

Lilium Tenii, Lévl.

W. W. Smith.



Lilium Davidi, Duch.

W. W. Smith.

TRANSACTIONS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXXVII

The Seedling Structure of Salix pentandra, Linn.

By Ian W. Seaton, B.Sc. (With Pl. VIII.)

(Read 16th November 1922.)

So far as I can ascertain, no record has been made, hitherto, of the germination of the seed of *Salix pentandra*. The seeds are minute and are adapted for wind dispersal by the possession of a parachute of long silky hairs. This parachute is an arillar structure and the hairs arise in groups of three or four from a ring formed of their contiguous bases. This ring fits on to the lower or radicle end of the seed (fig. 1). On moistening, it expands slightly and is then completely and easily detachable. The seed is pear-shaped and has a thin brown testa which conforms in shape to the enclosed embryo (fig. 2).

The embryo has oblong-oval, plano-convex cotyledons, the plane, adaxial faces of which are closely adpressed, a short, stout hypocotyl which ends abruptly, and a very small, terminal, peg-like radicle (fig. 3). The whole embryo, with the exception of the radicle, is green and shining.

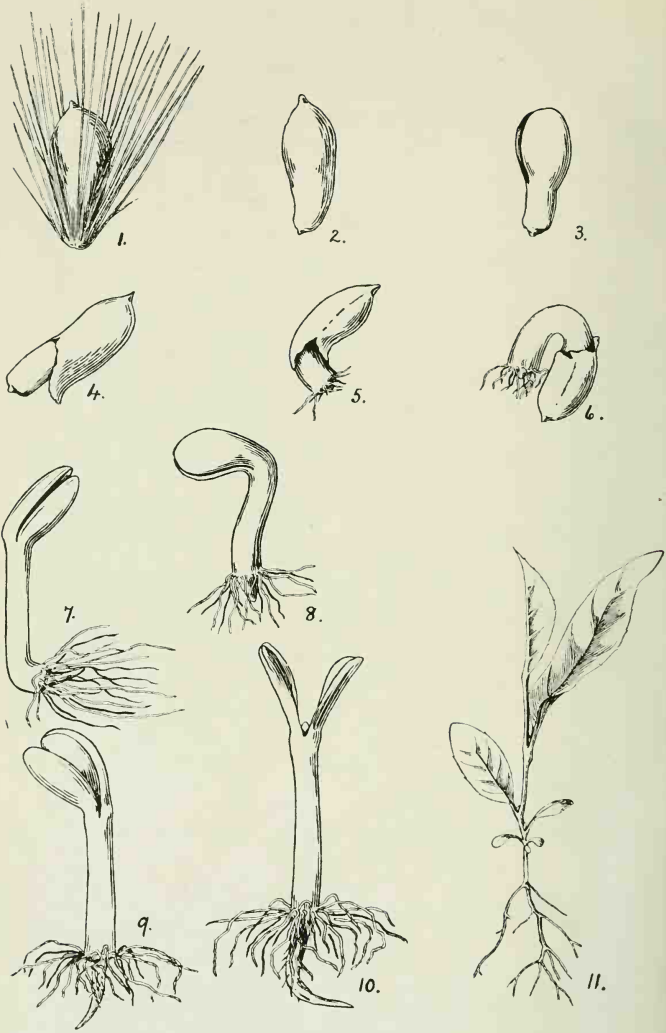
The seed is exalbuminous, the food reserve being stored in the cotyledons, which are comparatively large and fleshy. The embryo is nearly straight in this resting condition. The first process of germination is the elongation of the hypocotyl. Growth is more rapid along one side, and the seedling becomes bent in consequence. This arching, convex towards the soil surface, splits the seed coat and the curved middle part of the

hypocotyl protrudes, eventually coming above the soil level (figs. 4, 5, and 6). It is then seen that the bending is such that one cotyledon is directly above the other as they are withdrawn from the testa (fig. 7). Germination, then, is epigeal.

A straightening of the hypocotyl next ensues, and, as this process is nearing completion, the cotyledons begin to expand (figs. 8 and 9). Meantime, from the blunt lower end of the hypocotyl, which becomes tinged with red, there grow out numerous unicellular hairs, which act as would root hairs in the double function of fixation and absorption, though the former is probably their primary function in the natural habitat of the plant. This production of hairs from the hypocotyl conforms with the behaviour during germination of the macropodous embryos of typical helobic plants, and is, no doubt, correlated with the slow development of the radicle and the more immediate need of fixation. The radicle begins to show growth only after a perfect mat of these hairs has been produced round and above its area of attachment to the hypocotyl. Its further development, once initiated, seems to be fairly rapid, and later it bears a few root hairs in the usual definite area (fig. 10). The expanded cotyledons are only slightly larger than they are in the seed, and each now shows a very short petiole slightly thickened at its insertion on the hypocotyl. There is a very indistinct midrib in the cotyledon and a rather more noticeable apical indentation.

Although germination is quick, the seed coat being split on the fourth or fifth day, the plumule is slow in evolving, and is just discernible in seedlings about five weeks old (fig. 10). Following this stage growth is very slow, and after seven months the seedling has just produced its seventh leaf.

The first leaf produced is small, obovate, retuse and entire, with a distinct midrib but no other discernible venation. The second leaf differs, apart from its greater size, in having no apical indentation. The third tapers towards the base, is elliptical or oval, acute and entire, or may have one or two small teeth on each side. The ultimate leaves are variable, usually elliptical, acute, sometimes very shortly cuspidate, and are increasingly serrulate. All the leaves are a fresh shining green colour above, glaucous beneath, glabrous, simple, alternate, and petiolate. From the third leaf onwards they are alternately incurvinerved (fig. 11).



I. W. Seaton.

There is one point of more than ordinary interest about the germination of Salix as described in the foregoing paragraphs. Mr L. B. Stewart, Royal Botanic Garden, Edinburgh, has tried to germinate willow seed of most of the British species, during the last twenty years, and until now has had to confess failure. It was he who first drew my attention to the seedlings, and to him I am indebted for specimens. The seed used on this occasion was gathered by Dr. M. Wilson early in October from a tree near Bavelaw, on the edge of Balerno Moor. A second sample gathered from the same tree a fortnight later germinated just as successfully as the first supply. Both samples were collected in perfect condition, just as the seed was escaping from the capsules. Since the seeds are minute and since the embryos are green, it seems not improbable that immediate sowing is necessary to ensure germination. The seed did not receive any special treatment. It was grown in a pit at 60°–65° F. and germinated fairly freely in sand, in soil, and on moist filter paper. Another visit to the tree about 18th November resulted in the discovery of some seedlings germinated under natural conditions. These had just attained the expanded cotyledon stage shown in fig. 10.

There is a record by Sir John Lubbock (On Seedlings, vol. ii, p. 542) of the germination of two species of Willow, *S. cinerea* and *S. repens*, a seedling of the latter being figured. Comparison of the measurements of *S. repens* seed with those given in his account indicates that the cotyledons grow to a considerable extent in that species. No such growth could be determined in the case of *S. pentandra*.

EXPLANATION OF PLATE VIII.

Figs. 1–10 are ten times natural size; fig. 11 twice natural size.
Fig. 1. Seed of *Salix pentandra* with aril.
Fig. 2. Seed with aril removed.
Fig. 3. Embryo removed from seed coat.
Figs. 4–11. Stages in germination.
Fig. 4. Seedling five days after germination.
Fig. 10. Seedling five weeks old.
Fig. 11. Seedling seven months old.

PUCCINIA MIRABILISSIMA, PECK, A NEW BRITISH RECORD.

By MALCOLM WILSON, D.Sc., F.R.S.E., Reader in Mycology, University of Edinburgh.

(Read 16th November 1922.)

The occurrence in the vicinity of Edinburgh of *Puccinia mirabilissima*, a species hitherto only recorded from the Unites States of America, is a somewhat surprising circumstance. Up to the present this rust has been found in Utah, Montana, Colorado, and in the Sierra Nevada Mountains,[1] and there is a single record from Washington.[2] The fungus usually occurs on *Berberis repens*, but has also been found on *B. pinnata*, *B. nana*, *B. pumila*, and *B. Aquifolia*, species which are all included in the sub-genus *Mahonia*. It was first collected at Colinton near Edinburgh in October 1922 on *B. Aquifolia*, and has later been found on the same host at Newlands, Peeblesshire.

The fungus produces its small reddish sori abundantly on the under surface of the leaf, the attacked plants being rendered very conspicuous by the development of bright red spots on the upper leaf surface opposite to the fructifications. Up to the present only uredospores and teleutospores have been found, and these occur in the same sori. It is still doubtful whether any other spore stage is produced by the fungus, for though aecidia have been described on *B. repens* in the United States, the specific connection between these and the uredospores and teleutospores has not been proved.

The cushion-shaped almost hemispherical sori are made up of a large number of uredospores, intermingled with which are a few teleutospores. The uredospores possess long colourless pedicels which radiate out from the centre and form the bulk of the compact sorus. The uredospores are attached to these by a distinct articulation, and only separate at maturity, leaving the pedicels still in the sorus (fig. 1, p. 166). The spores are obovate or pyriform, with finely rugose wall, averaging $30 \times 18\,\mu$. Each possesses 2–4, usually 3, equatorially arranged

[1] Blasdale, W. C.: Observations on *Puccinia mirabilissima*. Erythea, vol. iii, 1895, p. 131.

[2] Plant Disease Survey, Supp. 23, 1922. Bur. Plant Industry, Dept. Agric. U.S.A.

germ-pores (figs. 2 and 3). The walls are unusually thick, and in consequence the spores bear some resemblance to unicellular teleutospores; in consequence, the species was originally incorrectly placed in the genus *Uromyces* as *U. sanguineus*.

The teleutospores possess unusually long pedicels, and in consequence project beyond the uredospores in the sorus. The pedicel is hyaline up to 200 μ long, and throughout almost the whole of its length the walls are so thick that the cell cavity is occluded. At the base, where the pedicel is often swollen, the walls are much thinner and the cell cavity is obvious (fig. 6). The wall consists of four layers. The innermost, next to the contents, is thin and dark coloured, and immediately outside this is the thick brown warted layer. This is followed by a hyaline layer, seen particularly at the apex and sides, and on the surface there is a very fine cuticularised layer. Two germ-pores are present in each cell, situated usually about the middle of the lateral walls; all the germ-pores usually lie in the same plane (figs. 5 and 8). The teleutospores average 35×24 μ.

In many cases the pedicel is not attached exactly at the base of the spore (figs. 6 and 10), and in a few cases the attachment is at the side of one cell, so that the longitudinal axis of the spore is at right angles to the pedicel (fig. 7). The peculiar three- and four-celled teleutospores described by Blasdale [1] were not observed.

Germination takes place within twenty-four hours when the spores are placed in water. The uredospore usually produces two germ-tubes, which generally soon give rise to two or three branches (fig. 4). The teleutospore, on germination, produces one germ-tube from each cell, and these may be either on the same or on opposite sides of the spore (figs. 9 and 10). Sporidia were not produced in the hanging drops.

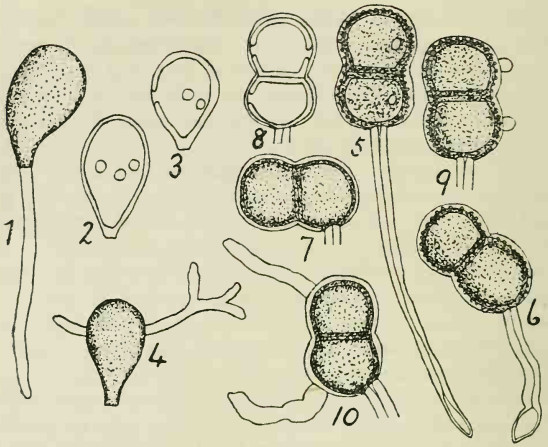
On account of the structure of the wall of the teleutospore and the presence of two germ-pores in each cell, this rust was removed from *Puccinia* by Magnus [2] and placed in the genus *Uropyxis*, Schröt. Sydow,[3] however, considers that *Uropyxis*

[1] *Loc. cit.*

[2] Über die Gattung *Uropyxis*, Ber. d. deutsch. bot. Ges., xvii, 1899, p. 119.

[3] Monographia Uredinearum, vol. i, p. 844.

is not of generic rank, and makes it a section of the genus *Puccinia*. The forms placed in this section are nearly all American, and none of the British species hitherto recorded are included in it.



1. Uredospore with pedicel. 2 and 3. Uredospores in optical section showing germ-pores. 4. Germinating uredospore. 5. Teleutospore showing germ-pores in surface view. 6 and 7. Teleutospores showing variation in point of attachment of pedicel. 8. Teleutospore in optical section showing germ-pores; one pore in the lower cell is at a slightly lower level. 9 and 10. Germinating teleutospores.

The method of dehiscence of the spores in this rust is of interest. As already described, the uredospores are distinctly articulated to their pedicels and become easily detached from them. The sorus has a powdery appearance, due to the large number of detached uredospores lying on its surface, the pedicels of which make up the inner portion of the compact fructification. The few teleutospores in each sorus project beyond the uredospore layer on account of their long pedicels. Dietel [1] has pointed out that in this and several other rusts the base of the teleutospore pedicel rapidly absorbs water when placed in it, and, in consequence, swells and

[1] Über Quellungserscheinungen an den Teleutosporenstielen von Uredineen, Jahrb. wiss. Bot., xxvi, 1894, p. 49.

becomes wedge-shaped, as seen in fig. 6. In the case of *P. mirabilissima*, the teleutospore pedicel is packed in tightly between the uredospore pedicels, and the swelling of the base of the former produces pressure in the sorus which causes the teleutospore, together with its persistent pedicel, to be violently shot out. This process can be readily observed under the microscope when sori removed from leaves which have been kept for a short time in dry air are mounted in water.

The introduction of *P. mirabilissima* into Scotland probably took place comparatively recently, for it is hardly conceivable that this conspicuous rust can have existed for a long period in the neighbourhood of Edinburgh without being observed. *Berberis Aquifolia* was introduced into this country from America in 1823, and is now extensively grown in gardens and shrubberies. It is easily reproduced and it is improbable that living plants have been brought in from that continent in recent years. From the known facts, it seems unlikely that the rust was introduced on this host. It may have been introduced on some other species of *Berberis* and subsequently spread to *B. Aquifolia*, but again there is no evidence for this. The introduction of living spores on the surface of plants not belonging to any of the host species is also a possibility. Shrubs and trees, especially conifers, are brought into the country in fairly large numbers, and there is no doubt that numerous living fungal spores are introduced on these. The occurrence of the rust in two situations which are over 20 miles apart suggests that its spread may now take place rapidly, and the common occurrence of the host plant will undoubtedly facilitate its distribution.

Observations on the Leaf of Senecio gonocladus, Sch. Bip. By Dorothy G. Wilson, M.A., B.Sc.

(Read 21st December 1922.)

A native of the Cape region of South Africa, *Senecio gonocladus* is a distinct xerophyte, characterised especially by the succulence of its cylindrical leaves, which measure about one inch in length and are covered externally by a coating of wax.

The leaf of this plant exhibits a peculiar and unusual structural feature. On the adaxial side, from the base of the leaf to the tip, there runs a strip of tissue which, compared with the rest of the leaf, is almost translucent. This area we have named the "window" of the leaf. In transverse section this translucent tissue is found to occupy about four-fifths of the total area, and microscopic inspection shows that it is structurally different from the remaining portion, or what may be called normal tissue of the leaf.

In the normal tissue, a layer of wax is present on the external surface, covering the epidermis, which consists of two rows of cells. These are arranged regularly, are rectangular in shape and thick-walled, the external walls of the cells of the outer row being especially thick. The inner row of cells of this double epidermis is interrupted at intervals by oil-ducts. Within the line of ducts, the normal tissue of the leaf is composed of parenchymatous, chlorophyll-containing cells, of fairly uniform size and shape. Vascular bundles, varying in number in different leaves, are embedded in the general parenchyma of the leaf and are arranged somewhat irregularly. Stomata are few in number, and where present are found in pits.

In the translucent tissue of the leaf a coating of wax is also present, covering as before a two-layered epidermis. But no oil-ducts are present and stomata are absent. The deeper-lying tissue is parenchymatous, the cells larger than in the normal tissue, with thinner walls and without chloroplasts. Nor are vascular strands present in this translucent tissue.

It thus becomes an interesting question as to whether the "window" is of any particular use to the plant. The translucency suggests that it may allow light to penetrate more readily to the chlorophyll-bearing tissues, thus facilitating photosynthesis. As the cell-walls are thin, light will penetrate them more easily, and as the cells are larger than those of the normal tissue, there are fewer walls to pass through.

Since the photosynthetic process results in an increase in weight, if it can be shown that the increase in a control leaf is greater than the increase in a leaf with the "window" blocked, both exposed to the same intensity of light for the same length of time, there would be reason to believe that the

" window " does have some effect on the total amount of light reaching the deeper tissues.

In this connection, the conclusions given below were based on the method employed by Sachs. This experimenter removed, in the morning, portions of leaves of equal area, or actual halves, dried these and then weighed. The remaining portions or halves were exposed all day and in the evening similarly dried and weighed. Increase in weight indicated gain due to photosynthesis.

In the cylindrical leaves of *S. gonocladus*, surface areas cannot readily be compared, but it was found that if leaves of equal thickness are carefully selected, cylinders can be punched out of them the weights of which are approximately the same, the probable error of the mean weight of the samples taken being less than 1 per cent.

Plants of *S. gonocladus* were thus selected with leaves of similar size. Some of the leaves were left in their normal condition and in an equal number the " windows " were blocked by painting them with indian ink. The plants were then placed in the dark until the leaves were found to be starch free. Cylinders were then punched out of half the normal leaves selected and from half of those with the " windows " blocked. These were weighed, and dried at 100° C. until the dry weight remained constant. The remaining leaves were exposed to light for varying lengths of time, after which drying and weighing was carried out as before.

In all the experiments performed, whether sunlight or artificial light was employed, it was found that the gain in dry weight in the leaf with the " window " blocked was less than the gain in the normal leaf. The experiments suggest, in fact, that the translucent tissue in the leaf is used by the plant as a means of illumination.

In conclusion, I have to express my thanks to Professor Wright Smith, Royal Botanic Garden, Edinburgh, for his kindness in providing facilities for the experiments carried out, and also to Dr. Graham and to Mr. L. B. Stewart for drawing my attention to the peculiarity in the structure of the leaf and for suggesting an experimental inquiry into its significance.

NOTES ON SCOTTISH PLANTS. By J. R. MATTHEWS, M.A., F.L.S.

(Read 15th February 1923.)

Ten years have elapsed since the publication of Notes on Mid-Perth Plants (Journ. Bot., 1913, p. 193), and although but a limited amount of field-work in that area has been accomplished during the interval, several plants of sufficient interest to justify some record of them have come under observation. While the notes which follow deal mainly with material collected in Mid-Perth, vice-county 88, mostly from the Lowland Earn district, reference is made also to certain plants gathered in other parts of Scotland. In these cases the Watsonian number or name of the county is indicated; where no such details are given the record refers to Mid-Perth.

I have had the valued and experienced aid of Mr. Arthur Bennett in dealing with certain difficult genera, especially *Potamogeton*, and Dr. Eric Drabble has kindly confirmed the naming of the pansies; to both gentlemen I am much indebted for their assistance.

Corydalis claviculata, DC. This is rare and local, especially in the Lowland districts of Perthshire. It occurs on wet, rocky places, Craig Rossie, Ochils—a somewhat isolated station.

Draba incana, L. var. *confusa* (Ehrh.). Ben Ledi. Quite characteristic, fruits with stellate hairs.

Sisymbrium altissimum, L. Railway bank, Dunning. An alien which is spreading.

Erysimum cheiranthoides, L. Apparently established on waste ground, near Tobermory, v.-c. 103, Mid-Ebudes. Dunn, in Alien Flora of Britain, remarks that it becomes rapidly rarer and less permanent northwards. Its occurrence in Mull would seem to indicate a widening range in the distribution of the plant. It is queried for v.-c. 103 by Ewing in The Glasgow Catalogue of Native and Established Plants.

Viola agrestis, Jord. One of the commonest segregates of *V. arvensis*, Murr. 72 Dumfries, 73 Kirkcudbright, 85 Kinross, 88 Mid-Perth.—*V. segetalis*, Jord. Cultivated land west of Dunning, and near Milnathort, v.-c. 85.—*V. obtusifolia*, Jord. Rather infrequent. Mid-Perth, Kinross, and Ayr-

shire (G. Brown, sp.).—*V. ruralis*, Jord. Plentiful on railway embankment near Kinghorn, v.-c. 85.—*V. derelicta*, Jord. Not uncommon, but often larger than the type. Kinross and Mid-Perth.—*V. Lloydii*, Jord. Very common. Dumfries, Kirkcudbright, Kinross, Mid-Perth. Many specimens are large-flowered and are perhaps better referred to var. *insignis*, Drabble.—*V. lepida*, Jord. In old pasture, several places near Dunning.—*V. lutea*, Huds. Not uncommon on the Ochils, often extremely small and showing considerable range of colour between the type and var. *amoena*, Henslow.—*V. Curtisii*, Forster. Sand-dunes, Southerness, Kirkcudbright. Taller and more slender than *V. Pesneaui*, with narrower leaves, but the distinction between the two is difficult.—*V. Pesneaui*, E. G. Baker. Southerness sand-dunes. Typical plants, passed by Mr. Baker.

Geranium nodosum, L. A few plants of doubtful origin in a small plantation, Duncrub, Dunning.

Potentilla norvegica, L. A casual at Dunning station; not permanent.

Alchemilla argentea, G. Don (*A. conjuncta*, Bab.). Cottage gardens, Dunning; origin unknown.

Rosa involuta, Sm. Several bushes by the burn above the village and in quantity on the Ochils near Knowes, Dunning. In both stations the hybrid is associated with the parents.

Sedum Telephium, L. Dr. Lloyd Praeger, in his account of the genus, separates this into two sub-species: *S. purpureum*, Link., and *S. Fabaria*, Koch. The latter appears to be the prevailing form in Mid-Perth and Kinross, and Dr. White (Flora of Perthshire, p. 146) states that all the specimens he examined seemed to belong to var. *Fabaria*.

Callitriche stagnalis, Scop. A common plant showing considerable variation. Well-grown specimens from a deep ditch west of Dunning were commented upon by Mr. Bennett: "This is a capital example of foliage. Had this been collected south of Yorkshire and sent *without* fruit, one would at once have said, trusting to leaves alone, *C. obtusangula*, Le Gall." The variety *serpyllifolia*, Lönnr., which is not infrequent, seems to be connected with the type by all gradations, and it may be a state rather than a true variety.—*C. intermedia*, Hoffm. (*C. hamulata*, Kuetz.). This is also extremely variable. A large form from the River Earn seems referable to *latifolia*,

Gilibert, if it is not simply a luxuriant state. Var. *pedunculata*, DC., by some retained as a species, is not so common as the type. It occurs here and there on gravel by Leadketty Burn, Dunning. Var. *homoiophylla*, Gren. et Godr., given specific rank by Williams (Prod. Fl. Brit., p. 509), under the name *C. angustifolia*, Hoppe, occurs in the same burn. I have not seen this variety in fruit.—*C. autumnalis*, L. Plentiful in Keltie Loch and Keltie Pond, Dunning, as a smaller form than usual.

Lythrum Salicaria, L. A local plant in Perthshire; recorded for Crieff neighbourhood, Lowland Earn, and now established lower down the river near Aberuthven.

Galium palustre, var. *elongatum* (Presl). River Earn, near Dalreoch Bridge.

Linnaea borealis, L. In my former notes, reference is made to the Duncrub station mentioned in White's Flora of Perthshire. The plant has certainly disappeared from this locality, no doubt as a result of recent changes in the woodlands.

Solidago Virgaurea, var. *cambrica*, Huds. Craig Rossie, Dunning, at about 1000 feet.

Aster Novi-Belgii, L., and *Tanacetum vulgare*, L., are not infrequent on the banks of the Earn.

Hieracium stictophyllum, Dahlst. (*fide* Druce). Several plants, rocky ground near Loch Arienas, Morven, v.-c. 97.

Campanula rapunculoides, L. Railway embankment west of Dunning Station, probably an escape from cultivation.

Phyteuma spicatum, L. has disappeared from the station mentioned in my former notes.

Verbascum Lychnites, var. *album*, Mill. A casual at Duncrub, Dunning.

Mentha longifolia, var. *nemorosa*, Willd. Quite established in several places near Dunning.—*M. spicata*, L. (*M. viridis*, L.). Banks of the River Earn.—*M. aquatica*, var. *minor*, Sole. Kirklands, Dunning. Var. *major*, Sole. Not infrequent, and common at the Whitemoss Loch.—*M. verticillata*, Huds. (*M. sativa*, L.). Since this represents *aquatica* × *arvensis*, considerable variation may be expected, and it is doubtful if any useful purpose is served in trying to attach varietal names to an extensive series of hybrid forms. Of hundreds of specimens examined, some seemed referable to var. *ovalifolia*, Opiz, and others apparently matched var. *acutifolia*, Sm.,

but many failed to agree with any of the numerous varieties that have been described.—*M. arvensis*, var. *Nummularia*, Schreb. Fields west of Dunning.

Polygonum heterophyllum, Lindm., and *P. aequale*, Lindm., constitute the common sub-species of the aggregate *P. aviculare* in Perth and Kinross.—*P. heterophyllum*, var. *boreale*, Lindm., associated with *Ranunculus reptans*, L., on the sandy shore of Loch Leven looks distinct, the succulence of the leaf being quite pronounced.

Rumex Hydrolapathum, Huds. River Earn, near Aberuthven. A gratifying extension in the range of this local plant in Perthshire.

Potamogeton polygonifolius, Pourr., var. *cordifolius*, C. & S. Cow's Moss, Dunning.—*P. decipiens*, Nolte. The Earn specimens come under var. *latifolius*, Hagst., but leaf-size is no certain mark of distinction in this genus.—*P. perfoliatus*, L. The type is common in the Earn. A state with very small leaves and short internodes occurs in the Whitemoss Loch.—*P. crispus*, L., var. *planifolius*, Meyer. River Earn, about a mile above Dalreoch Bridge.—*P. panormitanus*, Biv. Keltie Pond, Dunning. Passed as a form of *pusillus* until Hagström in his recent researches drew attention to the differences between the two species.—*P. trichoides*, Cham. et Schlecht. Whitemoss Loch. An addition to the list of Scottish plants. See Mr. A. Bennett's paper in Trans. Perth. Soc. Nat. Sci., vol. vi, p. 6, 1914.—*P. pectinatus*, L. A slender state. Discovered in Keltie Pond, Dunning, July 1919. Not an uncommon species, but hitherto unrecorded from Perthshire.

Zannichellia palustris, L. Keltie Loch. Very rare. See my note in Trans. Perth. Soc. Nat. Sci., vol. vii, p. 74, 1920.

Carex pulicaris, L., *f. montana*, Pugl. Turfy ground, Ben Ledi, 87 West Perth.

ADDITIONS TO THE FLORA OF ORKNEY, AS RECORDED IN WATSON'S "TOPOGRAPHICAL BOTANY," Second Edition (1883). By Colonel H. H. JOHNSTON, C.B., C.B.E., D.Sc., M.D., C.M., F.R.S.E., F.L.S.

(Read 19th April 1923.)

This paper forms a continuation of five papers on the same subject, one of which I read before the Scottish Natural History Society on 4th April 1895, and which was published in "The Annals of Scottish Natural History," No 15, pp. 173–181 (July 1895), and the other four before the Botanical Society of Edinburgh on 15th January 1914, 10th June 1920, 17th March 1921, and 20th April 1922, and which were published in the Society's "Transactions," vol. xxvi, pp. 207–217 (1914), and vol. xxviii, pp. 23–42 (1920), pp. 51–66 (1921) and pp. 98–117 (1922), respectively. Most of the plants mentioned in this paper were collected by me during the year 1922.

Before and after the publication of the second edition of Watson's "Topographical Botany," in 1883, several of the plants mentioned in the following list have been recorded from Orkney by me and other botanists; but as the value of botanical records is greatly enhanced by the possession of authentic specimens, I have included in this list the names of all specimens in my herbarium, which are either additional to or confirm doubtful records of the plants recorded from County No. 111 Orkney in the second edition of the above-mentioned book.

In the case of those plants which have already been recorded from Orkney, references are given in the following list, under each species and variety, to the books in which the records have been published. These records are principally contained in "A Tour through some of the Islands of Orkney and Shetland," in the year 1804, by Patrick Neill (1806); "Notice of some of the rarer Plants observed in Orkney during the Summer of 1849," by John T. Syme, Esq., published in the "Transactions of the Botanical Society of Edinburgh," vol. iv, pp. 47–50 (1850); "Florula Orcadensis—A list of plants reported to occur in the Orkney Isles," by H. C. Watson, Esq., F.L.S., published in "The Journal of Botany," No. xiii,

pp. 11–20 (January 1864); Annual Reports of the Botanical Exchange Club of the British Isles; "A new List of the Flowering Plants and Ferns of Orkney," edited by W. A. Irvine Fortescue, and published in "The Scottish Naturalist" (1882–1884); "Supplement to Topographical Botany," ed. ii, by Arthur Bennett, A.L.S. (1905); and "Flora Orcadensis," by Magnus Spence, F.E.I.S. (1914).

The nomenclature followed is that of the second edition of Watson's "Topographical Botany" (1883), except in the case of species and varieties which are not recorded in that work. In the latter case the nomenclature adopted is that of "The London Catalogue of British Plants," tenth edition (1908), except where otherwise stated. Non-native plants, which have become naturalised in Orkney, are distinguished by a * prefixed to the names, and the names of casuals are printed in italics.

Of the 23 species and varieties recorded from Orkney in the following list, 10 are native, 1 is naturalised, 4 are mere casuals introduced into Orkney through the agency of cultivation, and 8 were planted by man.

Abbreviations.

"Annals Scot. Nat. Hist." = The Annals of Scottish Natural History.

Bennett, "Suppl. Top. Bot." = Supplement to H. C. Watson's Topographical Botany, second edition. By Arthur Bennett, A.L.S. (1905).

"Bot. Exch. Club Report" (separate Reports by the Secretary and Distributor) = Report of The Botanical Exchange Club of the British Isles, at present called The Botanical Society and Exchange Club of the British Isles.

"Journ. Bot." = The Journal of Botany.

"Lond. Cat." = The London Catalogue of British Plants.

Neill, "Tour" = A Tour through some of the Islands of Orkney and Shetland, in the year 1804. By Patrick Neill, A.M., Secretary to the Natural History Society of Edinburgh (1806).

"Scot. Nat." = The Scottish Naturalist.

Spence, "Flora Orcadensis" = Flora Orcadensis. By Magnus Spence, F.E.I.S. (1914).

Watson, "Top. Bot." = Topographical Botany, second edition. By H. C. Watson (1883).

Corrections.

In "Trans. Bot. Soc. Edin.," vol. xxviii, part ii, p. 56 (1921), *for* "*Fuchsia Riccartoni*, Hort. Am. bor. Cult. (*fide* G. C.

Druce)," *read* "*Fuchsia macrostema*, Ruiz et Pav. (*fide* T. A. Sprague)."

In "Trans. Bot. Soc. Edin.," vol. xxviii, part ii, p. 57 (1921), *for* "TARAXACUM SPECTABILE, *Dahlst.*, *var.* MACULIGERUM, *Dahlst.* (*fide* G. C. Druce)," *read* "TARAXACUM NÆVOSUM, *Dahlstedt* (*fide* Hugo Dahlstedt)."

In "Trans. Bot. Soc. Edin.," vol. xxvi, p. 221 (1914), and Spence, "Flora Orcadensis," p. 132 (1914), the plants from the Links of Melsetter, erroneously recorded under "GENTIANA CAMPESTRIS, *Linn.*," are GENTIANA AMARELLA, *Linn.* (*fide* C. E. Salmon, August 1921).

Hesperis matronalis, Linn. (*fide* T. A. Sprague).—Rubbish heap at seashore, 10 feet above sea-level, Hamla Voe, Stromness Harbour, Stromness, Mainland, 7th July 1922, Henry Halcro Johnston. Not native. Rare. Plants in full flower on 7th July 1922 and in fruit on 14th October 1922. This species is cultivated in gardens in Stromness, from which plants of it have probably been thrown out with weeds and rubbish.

The aggregate species *Viola arvensis*, Murray, is recorded from Orkney in Watson, "Topographical Botany," ed. ii, p. 57 (1883), but the following segregate species is not mentioned in that book. The nomenclature followed for this segregate species is that of "The British Pansies," by Eric Drabble, D.Sc., F.L.S., reprinted from "The Journal of Botany," vol. xlvii (1909) :—

GROUP I.—ARVENSES.

Viola derelicta, Jordan, ap. Billot, "Fl. France et Allem." 101 (nomen) (*fide* W. G. Travis).—Border of an oat field, 60 feet above sea-level, Bigging, Birsay, Mainland, 8th September 1922, H. H. Johnston. Not native. A weed of cultivation. Common. Plants in flower, and sparingly in unripe fruit, and growing among *Viola tricolor*, Linn. Corolla small; two upper petals uniformly pale violet, or whitish-violet in different plants, or rarely in the same plant; two lateral petals white, each with 1–2 dark violet lines; lower petal white, with 5–7 dark violet lines, and a yellow base;

spur of lower petal dark purple, as long as the calycine appendages. Two lateral petals and lower petal turning pale yellow on drying. Confirms the record of this species from Orkney (Stromness, Mainland, 1900, Rev. E. S. Marshall) in Drabble, "The British Pansies," p. 21 (1909); "Annals Scot. Nat. Hist.," No. 73, p. 59 (January 1910); and "Trans. Bot. Soc. Edin.," vol. xxvii, p. 55 (1916).

POLYGALA OXYPTERA, *Reichb.* [=POLYGALA DUBIA, *Bellynck*] (*fide* C. E. Salmon).—Grassy cliffs at seashore, 10 feet above sea-level, Scapa, Saint Ola, Mainland, 25th July 1876 (the same specimen was identified as "POLYGALA DEPRESSA, *Wender*," by the late Dr. J. T. I. B. Boswell), and 5th July 1912, H. H. Johnston; natural pasture at edge of sea-cliffs, 50 feet above sea-level, Howequoy Head, Holm, Mainland, 20th August 1922, H. H. Johnston; and grassy banks at burnside, 110 feet above sea-level, Geo Burn, Germiston, Stenness, Mainland, 20th September 1922, H. H. Johnston. Native and rare at all of these three stations. Confirms the record of this species from Orkney (Rousay, July 1896, Miss Webb) in Bennett, "Suppl. Top. Bot.," p. 17 (1905). See "Annals Scot. Nat. Hist.," No. 56, p. 229 (October 1905); and Spence, "Flora Orcadensis," p. 9 (1914).

Medicago lupulina, Linn., var. *Willdenowiana*, Koch (*fide* G. C. Druce).—Gravelly ground round filter beds, 200 feet above sea-level, Kirkwall Waterworks Reservoir, near Hatston, Saint Ola, Mainland, 9th August 1920, H. H. Johnston. Not native. Rare. Plants in unripe fruit and sparingly in flower. Confirms the record of this variety from the same station on the same date, by Dr. G. Claridge Druce in "Bot. Exch. Club Secretary's Report for 1921," vol. vi, part iii, p. 378 (September 1922). *Medicago lupulina*, Linn., is recorded as a non-indigenous plant from Orkney in Watson, "Top. Bot.," ed. ii, p. 107 (1883), but the var. *Willdenowiana*, Koch, is not mentioned in that book.

[*Geum urbanum*, Linn.—Plantation of trees, 80 feet above sea-level, Binscarth, Firth, Mainland, 6th September 1922, H. H. Johnston. Not native. Plants introduced into Orkney in the latter half of the nineteenth century and planted at Binscarth, where they have multiplied and spread in the plantation of trees. This species is recorded from Orkney in "Annals Scot. Nat. Hist.," No. 26, p. 111 (April 1898);

Bennett, "Suppl. Top. Bot.," p. 31 (1905); and Spence, "Flora Orcadensis," p. 21 (1914); but, having been planted in an artificial plantation of trees, and being still confined to that plantation, it has no claim to be included in the flora of Orkney, any more than the exotic trees in the same plantation.]

[*Rubus spectabilis*, Pursh (*fide* D. K. Hughes).—Rocky ravine at waterfall, 120 feet above sea-level, Burn of Laro, Rousay, 24th May 1922, H. H. Johnston. Not native. Planted by man, but by whom I have not as yet ascertained. Ten shrubs, 4–7 feet high, in full flower, with large rose-pink petals, only seen by me at the Burn of Laro. This pretty-flowered Bramble is a native of North America, and, on 27th May 1922, I also saw it growing in a plantation of trees at Trumland House, Rousay.]

[*Rosa gallica*, Linn. (*fide* William Barclay).—Grassy bank at roadside on the outer side of a garden stone wall, 20 feet above sea-level, Castlegreen, Saint Ola, Mainland, 28th August 1922, H. H. Johnston. Not native. Planted by man both inside and outside the garden of Castlegreen House. Very rare. Plants sparingly in flower-bud. This species is recorded from the same station by Dr. G. Claridge Druce in "Bot. Exch. Club Secretary's Report for 1920," vol. vi, part i, p. 123 (September 1921), but, being merely a cultivated garden plant, it has no claim to be included in the flora of Orkney.]

[*Cratægus Oxyacantha*, Linn., *probably* (*fide* D. K. Hughes, who states that "it is not possible to decide in the absence of both flowers and fruit").—Near the edge of grassy cliffs at seashore, 50 feet above sea-level, Berstane, Saint Ola, Mainland, 19th October 1922, H. H. Johnston. Not native. Three shrubs, planted by man, only seen by me on the top of the highest part of the cliffs between Berstane Bay and Wideford Burn.]

[*Sambucus nigra*, Linn.—Whin and elder hedge, 50 feet above sea-level, The Loan, Gyre, Orphir, Mainland, 11th August 1879, H. H. Johnston; not native, planted by the late James Johnston of Coubister on 6th April 1841, plants in flower; and marsh, 80 feet above sea-level, between Fursan and the Burn of Woodwick, Evie, Mainland, 28th July 1922, H. H. Johnston, not native, planted by man along with a few bushes of *Salix viminalis*, Linn., forming a small clump of

low shrubs, none of which were in flower or fruit. In the Rev. Dr. George Barry's "The History of the Orkney Islands," p. 280 (1805), the Elder is recorded as growing "on rills in Hoy," where it still grows on the banks of Kirk Burn, near The Bu, but, as this species only grows in Orkney where it has been planted by man, it has no claim to be included in the flora of the county.]

The aggregate species TARAXACUM OFFICINALE, *Wiggers*, is recorded from Orkney in Watson, "Top. Bot.," ed. ii, p. 236 (1883), but the following five segregate species are not mentioned in that book :—

TARAXACUM BELLULUM, *Dahlstedt* (*fide* Hugo Dahlstedt).—Grassy banks at seashore, 5 feet above sea-level, Sweyn Holm, H. H. Johnston. Native. Rare. Plants sparingly in flower, and growing in an uninhabited and uncultivated island, used for grazing sheep on in summer. Dr. Hugo Dahlstedt informs me that this species also grows in Western Norway.

TARAXACUM JOHNSTONII, *Dahlstedt*, in "Botanical Exchange Club Secretary's Report for 1922," vol. vi, part v, p. 774 (May 1923) (*fide* Hugo Dahlstedt).—Crags on hillside, Green Hill, Rousay, 9th May 1884, H. H. Johnston. Plants in flower (the same specimen was identified as "TARAXACUM OFFICINALE, *Wiggers*, *var.* UDUM (*Jordan*)," by the late Dr. J. T. I. B. Boswell) ; natural shell-sandy pasture at seashore, 10 feet above sea-level, Links of Mirkady, Deerness, Mainland, 21st April 1922, H. H. Johnston, common, plants sparingly in flower on 21st April 1922, and sparingly in fruit on 23rd June 1922 ; wet grassy ditch-side, 20 feet above sea-level, Hall of Tankerness, Saint Andrews, Mainland, 24th April 1922, H. H. Johnston, common, plants sparingly in flower ; heathery and grassy hillside, 280 feet above sea-level, Syradale, Firth, Mainland, 9th May 1922, H. H. Johnston, common, plants sparingly in flower ; grassy cliffs at seashore, 10 feet above sea-level, west side of Walkmill Bay, Orphir, Mainland, 11th May 1922, H. H. Johnston, rare, plants in full flower ; rocky crags on hillside, 90 feet above sea-level, Frotoft, Rousay, 27th May 1922, H. H. Johnston, common, plants in full flower ; and grassy and sandy banks at seashore, 10 feet above sea-level, Sandside, Bay of Sandside, Graemsay, 8th July 1922, H. H. Johnston, rare, plants sparingly in

flower. Native at all these seven stations, in three different islands.

TARAXACUM TANYLEPIS, *Dahlstedt*, in "Botanical Exchange Club Secretary's Report for 1922," vol. vi, part v, p. 776 (May 1923) (*fide* Hugo Dahlstedt).—Natural stony pasture at seashore, 5 feet above sea-level, Sweyn Holm, 29th May 1922, H. H. Johnston. Native. Common. Plants in full flower, and growing in an uninhabited and uncultivated island, used for grazing sheep on in summer.

TARAXACUM NÆVOSIFORME, *Dahlstedt* (*fide* Hugo Dahlstedt).—Grassy banks, Hoy, 9th July 1877, H. H. Johnston, plants in flower (the same specimen was identified as "TARAXACUM OFFICINALE, *Wiggers*, *var.* UDUM (*Jordan*)," by the late Dr. J. T. I. B. Boswell); roadside, Gyre, Orphir, Mainland, 11th October 1880, H. H. Johnston, plants in fruit (the same specimen was identified as "TARAXACUM OFFICINALE, *Wiggers*, *var.* UDUM (*Jordan*)," by the late Dr. J. T. I. B. Boswell); pasture, Burn of Ore, Waas, Hoy, 3rd June 1884, H. H. Johnston, plants in flower and fruit (the same specimen was identified as "TARAXACUM OFFICINALE, *Wiggers*, *var. a.* DENS-LEONIS, *Desf.*," by the late Dr. J. T. I. B. Boswell); grassy banks at seashore, 10 feet above sea-level, Hamla Voe, Stromness Harbour, Stromness, Mainland, 12th May 1922, H. H. Johnston, plants in full flower; grassy banks at seashore, 10 feet above sea-level, Langskaill, Gairsay, 29th May 1922, H. H. Johnston, plants in full flower; moist natural pasture at seashore, 10 feet above sea-level, The Taing, Viera, 3rd June 1922, H. H. Johnston, plants in full flower; and rank natural pasture near seashore, 10 feet above sea-level, Kili Holm, near Egilsay, 7th June 1922, H. H. Johnston, plants in full flower. Native and common at all these seven stations, in five different islands. This species also grows in Sweden.

TARAXACUM NÆVOSUM, *Dahlstedt* (*fide* Hugo Dahlstedt).—Grassy banks at seashore, 10 feet above sea-level, Hamla Voe, Stromness Harbour, Stromness, Mainland, 19th May 1920, and 12th May 1922, H. H. Johnston, plants in full flower on both dates; grassy banks at seashore, 15 feet above sea-level, Lower Whitehall, Stronsay, 15th June 1922, H. H. Johnston, plants in flower and fruit; and grassy banks at seashore, 10 feet above sea-level, The Ness, Papa Stronsay, 19th June

1922, H. H. Johnston, plants in flower and fruit. Native and common at all these three stations, in three different islands. This species also grows in the Færoes, Iceland, Norway, Sweden, and England.

Aster salignus, Willd. (*fide* J. Hutchinson).—Grassy banks at burnside, 10 feet above sea-level, Burn of Boardhouse, Birsay, Mainland, 18th September 1922, H. H. Johnston. Not native. One clump of plants, 7 feet long by 3 feet broad, in flower and undeveloped fruit, below the bridge and near houses at the seashore.

Calluna vulgaris, *Hull*, *var.* incana, *Reichb.*—Heath at the seashore, 20 feet above sea-level, Ha Wick, Waas, 5th June 1884 (plants not in flower or fruit), and 11th September 1922 (plants in full flower), H. H. Johnston. Native. Common. Stem and lower surface and margins of the leaves densely clothed with white hairs. Corolla light purple. This hairy variety of the Ling is recorded from the same station ("near the Berry, Walls"), by Mr. W. A. Irvine Fortescue in "Scot. Nat.," No. xlviii, p. 371 (October 1882), but without any varietal name. See Spence, "Flora Orcadensis," p. 45 (1914).

*Mentha sylvestris, *Linn.* [=*Mentha longifolia, *Huds.*] (*fide* Arthur Bennett).—Marshy burnside, 180 feet above sea-level, Shurton, Burn of Woodwick, Evie, Mainland, 28th July 1922 (plants not in flower or fruit), and 5th October 1922 (plants in flower-bud), H. H. Johnston. Naturalised. Rare. Fresh leaves with the aromatic odour of Horse-Mint. A new record for this species for H. C. Watson's county No. 111 Orkney.

[*Populus balsamifera*, Linn. (*fide* S. A. Skan). *Salix pentandra*, Linn. (*fide* S. A. Skan). *Salix viminalis*, Linn. (*fide* S. A. Skan).—Grassy banks at burnside, 130 feet above sea-level, Burn of Hillside, at the bridge on the Dovnby-Evie Road, Birsay, Mainland, 22nd September 1922, H. H. Johnston. Not native. All three species planted by man. Rare. Plants not in flower or fruit. *Salix viminalis*, Linn. (*fide* S. A. Skan), also from a marsh, 80 feet above sea-level, between Fursan and the Burn of Woodwick, Evie, Mainland, 28th July 1922, H. H. Johnston. Not native. Planted by man, along with a few bushes of *Sambucus nigra*, Linn., forming a small clump of low shrubs, none of which were in flower or fruit.]

POTAMOGETON RUTILUS, *Wolfgang* (*fide* Arthur Bennett).—Mud at bottom of shallow water in a loch near the seashore, 7 feet above sea-level, Loch of Ayre, Saint Mary's Village, Holm, Mainland, 19th August 1922, H. H. Johnston. Native. Common in the Loch of Ayre. Plants in full flower. A new record for this species for H. C. Watson's county No. 111 Orkney. Mr. Arthur Bennett, in a note dated 6th November 1922, writes as follows :—" P. RUTILUS, *Wolf.*=P. CÆSPITOSUS, *Nolte*. Your specimens come about half-way between the Swedish RUTILUS and the Schleswig-Holstein CÆSPITOSUS (of which I possess a specimen from Nolte himself). The turios (winter-buds) are just like what Hagström describes."

CATABROSA AQUATICA, *Beauv.*, *var. b.* LITTORALIS, *Parn.* (name confirmed by Arthur Bennett).—Marshy shell-sandy edge of a swamp near the seashore, 20 feet above sea-level, Loch of Aikerness (now a swamp through drainage of the loch), Evie, Mainland, 6th October 1922, H. H. Johnston. Native. Rare. Plants sparingly in flower. Anthers pale yellow. This species is recorded from Orkney in Watson, " Top. Bot.," ed. ii, p. 486 (1883), but the *var. b.* LITTORALIS, *Parn.*, is not mentioned in that book. The late Dr. A. R. Duguid, in his manuscript " Flora Orcadensis " (1858), records CATABROSA AQUATICA, *Beauv.*, from the Loch of Aikerness, but, no doubt, it was the *var. b.* LITTORALIS, *Parn.*, he saw there, because I did not see the type of the species at that station. See " Journ. Bot.," No. xiii, p. 17 (January 1864) ; " Scot. Nat.," New Series, p. 110 (January 1884) ; " Annals Scot. Nat. Hist.," No. 33, p. 39 (January 1900) ; and Spence, " Flora Orcadensis," p. 88 (1914), where the *var. b.* MINOR, *Babington*, " Manual of British Botany," ed. i, p. 366 (1843) [=*var. b.* LITTORALIS, *Parn.*], is mentioned as being more common in Orkney than the type of the species.

BRACHYPODIUM SYLVATICUM, *Roem. et Schult.*, *var. b.* GLABRESCENS, *Syme* (*fide* Arthur Bennett).—Grassy cliffs at seashore, 30 feet above sea-level, Lingro, Scapa Bay, Saint Ola, Mainland, 24th August 1922, H. H. Johnston, plants in full flower ; and grassy cliffs at seashore, 50 feet above sea-level, Berstane, Saint Ola, Mainland, 19th October 1922, H. H. Johnston, plants in fruit. Native and common at both these stations. BRACHYPODIUM SYLVATICUM, *Roem. et Schult.*, is recorded from Orkney in Watson, " Top. Bot.,"

ed. ii, p. 501 (1883), but the *var. b.* GLABRESCENS, *Syme*, is not mentioned in that book. In the late Dr. A. R. Duguid's manuscript "Flora Orcadensis" (1858), this species is recorded as having been found at the seashore at Scapa and Berstane by Dr. Gillies and Dr. A. R. Duguid, but, no doubt, it was the *var. b.* GLABRESCENS, *Syme*, they found there, because I did not see the type of the species growing at either of these two stations. See "Journ. Bot.," No. xiii, p. 17 (January 1864); "Scot. Nat.," No. iii, New Series, p. 111 (January 1884); "Annals Scot. Nat. Hist.," No. 33, p. 42 (January 1900); Bennett, "Suppl. Top. Bot.," p. 108 (1905); and Spence, "Flora Orcadensis," p. 91 (1914).

Vegetative Propagation of Haemanthus hirsutus, Baker. By R. J. D. Graham and L. B. Stewart.

(Read 17th May 1923.)

Detached scale leaves of *Haemanthus hirsutus* placed on sand and given occasional water or left dry on a shelf in a glasshouse with an intermediate temperature were found to produce buds. On sand or shelf, development was equally good, and took place most readily from January to March. Scale leaves placed on sand in April remained fresh till January of the following year, when bud development started profusely. The buds form most generally on the abaxial side of the scale, more rarely on the adaxial side, and the development is independent of the surface of the scale exposed to light or moisture. Development always occurs on the younger portion of the scale towards the base, where buds form either singly or in colonies of four or five. The buds originate from the tissue of the scale and not from the stem, as was proved by cutting off the base of the scale, thus removing any traces of stem structure, which might have adhered to the scale.

Microscopic examination of the scale shows a limiting single-layered epidermis with thin cuticle. This is succeeded by many layers of parenchyma containing starch uniformly distributed. On the abaxial side of the scale extending up to the medianally placed vascular bundles the parenchyma is chlorophyllous. Development of the buds is initiated in the superficial layers of this chlorenchyma. Buds with three

leaves developed show only a connection extending to the third and fourth layer of the chlorenchyma, and at no time is there vascular connection between the buds and the vascular strands of the scale.

The first leaf of the bud is juvenile in character, consisting only of a circular swollen base. The cortical tissues of this leaf are chlorenchymatous and contain large starch grains. The second and third leaves are transitional, with minute projections representing the lamina. Their internal anatomy corresponds with that of the first leaf. The first and second leaves rapidly lose their contents and function as scale leaves. The fourth leaf shows a persistent small green lamina with characteristic ciliate margin.

The production of adventitious buds on scale leaves of various Monocotyledons has been described by Balfour,[1] and has been figured in *Ornithogalum thyrsioides* by Green.[2] It is of interest to record that by utilising for propagation buds developed artificially from the scales of *Haemanthus hirsutus*, early maturity is secured. Year-old plants so propagated show as much growth as four-year-old bulbs raised from seed.

The Propagation of Camphor by Stem Cuttings. By Oona Reid, B.Sc. (With Pl. IX.–XI.)

(Read 18th October 1923.)

The camphor tree is usually propagated from seed, but commercially may be propagated by cuttings (1). Mr. L. B. Stewart at the Royal Botanic Garden, Edinburgh, discovered that by using etiolated branches he could accelerate the rooting of these cuttings considerably. A series of experiments was made with normal and etiolated shoots and the results give conclusive evidence that such is the case.

To secure etiolated shoots two large cheese-cloth bags lined with brown paper were made and tied securely over two of the top branches of a camphor tree, 30–40 feet high, excluding light but leaving ample room for the development of the portions of the enclosed branches.

[1] Balfour, J. H.: Class Book of Botany, 1854, p. 657.
[2] Green, R.: Manual of Botany, 1904, p. 34.

Experiment I.—One of the bags was removed after fourteen days, and five cuttings, 6 inches–12 inches (seven to twelve internodes) in length were made, using the terminal portion of the most actively growing shoots. These were placed in the propagating pit, temp. 60° F., along with a control of similar cuttings from a normal branch. Two days later it was found that while the normal slips became flaccid and cast a considerable number of leaves, the etiolated lost less turgidity and no leaves, although during the time the shoots were in the dark a certain percentage of leaves were shed. On the sixth day callus formation was evident on the shortest etiolated cutting, *i.e.* the youngest internode through which a cutting had been made, and by the end of fourteen days the etiolated cuttings had all with one exception formed callus. The controls only showed callus in one case, and then only after twenty-eight days, and to a very slight extent (fig. 1).

Experiment II.—The second bag was left on for twenty-eight days, and by doubling the time the branch was more noticeably etiolated than in the first experiment, in that the stems were winged, the internodes longer, the leaves reduced in size and blanched. Terminal cuttings were made of the etiolated and of the normal stems 4–6 inches in length, as in the previous experiment, but this time the number of internodes was noted and never exceeded six, while those of the first bag varied from seven to twelve. Callus appeared on the fourth day onwards on 75 per cent. of the etiolated, and two days later on the same percentage of the control cuttings, but in subsequent development the amount of callus produced on the individual etiolated shoot greatly surpassed that produced on the normal.

Experiment III.—Cuttings were made of the normal stem at the 12th internode, with the terminal 4th–6th nodes removed. These were placed in the propagating pit under an inverted flower-pot with the hole closed. By the end of a week callus formation was visible at the apices of the cuttings, *i.e.* about the 4th or 6th internode of the whole shoot (fig. 2).

These experiments thus show that etiolation appreciably hastens callus formation, especially in older stems: that a smaller proportion of the more etiolated branches form callus, the optimum time of etiolation having probably been exceeded;

and that under favourable conditions callus forms more readily at the younger parts of the stem.

Investigation of the internal anatomy of the normal stem, of the same age as that used for propagation, was carried on simultaneously. Camphor, like the other LAURINEAE, shows quite a normal arrangement of stem tissues, the most noticeable feature being a continuous stereom in the pericycle. This was found to consist of crescent-shaped patches of prosenchymatous elements opposite the phloem, joined by a single layer of U-shaped stone cells (2). It was particularly noticed that although the cell walls gave all the lignin reactions, the cells themselves still retained their protoplasmic contents (fig. 3).

A series of sections was made from the 1st to the 10th node, in order to trace the process of development of the stereom in the normal stem. No lignification is evident till after the 2nd node, and then only in the xylem vessels to a slight extent. About the 3rd node slight lignification appears in the pericycle, in the form of small patches opposite the phloem, gradually increasing and finally linking up, by means of stone cells, between the 6th and 8th nodes.

In the case of the stem etiolated for fourteen days, no lignification is visible in the pericycle till the 6th node is sectioned, although the vessels of the xylem show lignification after the 3rd node; and even at the 8th node the crescentic patches are small in size and discontinuous, no stone cells being visible. A detailed examination of the individual cells shows reduction in thickness of cell wall with a corresponding increase in protoplasmic content (fig. 4).

During this partial etiolation, the pericyclic stereom invariably present at the 6th internode of the normal stem becomes transformed into thin-walled parenchyma. The change is gradual, and at the 8th–10th internodes lignification still persists, but never in a continuous ring.

Sections were made of etiolated cuttings in every stage of callus formation. In fig. 5 division is most active in the cambium and inner cortex, where it is seen giving rise to a large pad of callus, which will spread to cover the entire wounded surface. Cuttings four days old show a well-formed callus ring with a central discoloured pith. Fig. 6 shows necrotic pith cells with discoloured cell walls extending for a distance of 6–8 mm. from the wound. The pith cells

adjacent to the xylem are living and are in an active state of division, the divisions being laid down at right angles to the wounded surface, differing in this respect from those described by Sorauer (3), which are laid down parallel to the cut surface.

This development corresponds with that described by Stoll (4) for *Hibiscus Reginae*, *Passiflora quadrangularis*, and *Giselina littoralis*, viz. "That every tissue of the plant excepting true wood, bast and epidermal cells, is capable of aiding in the construction of callus, the initial and chief growth being from the cambium." Cell division was also found in the pericycle and inner cortex as described above. As described by Simon (5) for *Populus*, spp., it is impossible here also to separate cambial and cortical callus, because it is formed simultaneously by divisions parallel to the wounded surface. The activity of the medullary meristem, coupled with the growth from the cambial, pericyclic, and cortical meristems, results in the closing of the wounded surface.

Important questions arising out of this investigation are, firstly, what has become of this pericyclic stereom during etiolation? and, secondly, why should callus formation proceed more easily in its absence? There is no reason to suppose that the process of lignification is irreversible as long as the cell in question remains alive. The answer to the first question then depends on what is the acknowledged function of lignified tissue. Is it purely mechanical, or may it not act also as a form of reserve food, accumulated and laid down only under tonic conditions? If so, the problem is simplified, for naturally during the process of etiolation the plant would have to depend on its internal reserves. Regarding the second question, it is recognised that any undifferentiated tissue capable of rapid divisions may become meristematic, under given conditions, and form callus, and as cell division is evident in the pericycle, this tissue is able to contribute when in a non-lignified condition. It seems reasonable to suppose then that callus formation would proceed more easily in the absence of a lignified pericycle, which might present a formidable barrier to movement of reserve, and to growth in thickness, as the chief growth of callus takes place in the cambium.

This paper in no way aspires to deal fully with a subject in which there are so many possibilities. The effect of etiolation on the natural oils, on the translocation of food, etc.,

has yet to be worked out before the topic can be in any sense of the word completed.

Finally, I wish to thank Professor W. Wright Smith, Regius Keeper of the Royal Botanic Garden, Edinburgh, for providing facilities for carrying out the investigation.

REFERENCES.

(1) CREVOST, CH., and DE FENIS, F.: Bull. Ec. de L'Indochine, xxiv, 1921.
(2) SOLEREDER, H.: Systematic Anatomy of Dicotyledons, 1908.
(3) SORAUER, P.: Physiology of Plants, Trans. Weiss., 1895.
(4) STOLL, R.: Über die Bildung des Kallus bei Stecklingen, Bot. Zeit., xxii, 1874.
(5) SIMON, S.: Experimentelle Untersuchungen über die Differenzierungsvorgänge in Callusgewebe von Holzgewachsen, Jahr. wiss. Bot., xlv, 1908.

EXPLANATION OF PLATES IX.–XI.

Fig. 1. Cuttings nine weeks old, made at 10–12 internodes. Heavy callus formation is visible on the etiolated shoot on the left, while the normal shoot on the right has no callus visible, $\times\frac{1}{2}$.

Fig. 2. Cuttings ten days old of normal shoots which are etiolated under an inverted flower-pot, forming callus at the apex about the 4th internode, $\times\frac{1}{2}$.

Fig. 3. Transverse section of normal stem, 7th–8th internode, with crescents of pericyclic stereom opposite the phloem joined by stone cells. The lignified cells show protoplasmic contents, $\times 175$.

Fig. 4. Transverse section of etiolated stem, 7th–8th internode, showing the now thin-walled cells of the pericycle with large protoplasmic contents in striking contrast with the character before etiolation in fig. 3, $\times 175$.

Fig. 5. Longitudinal section of etiolated cutting five weeks old, showing formation of callus by meristematic activity of cambium, $\times 68$.

Fig. 6. Longitudinal section of etiolated cutting five days old, with the pith cells in active division, the new cell walls being laid down at right angles to the cut surface, $\times$ 175.

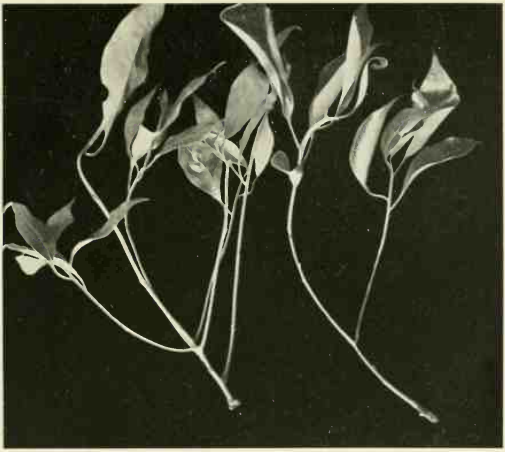


Fig. 1.

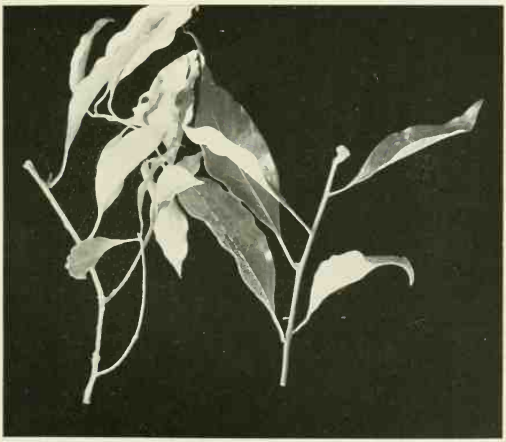


Fig. 2.

O. Reid. [*Photo. A. R. Easton.*

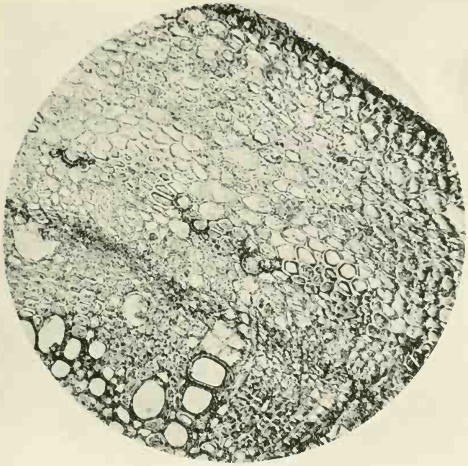


Fig. 3.

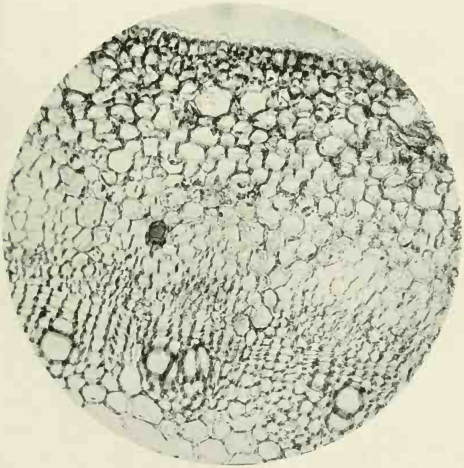


Fig. 4.

O. Reid. [*Photo. A. R. Easton.*

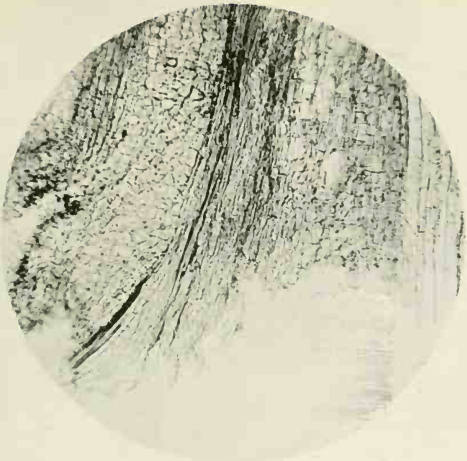


FIG. 5.

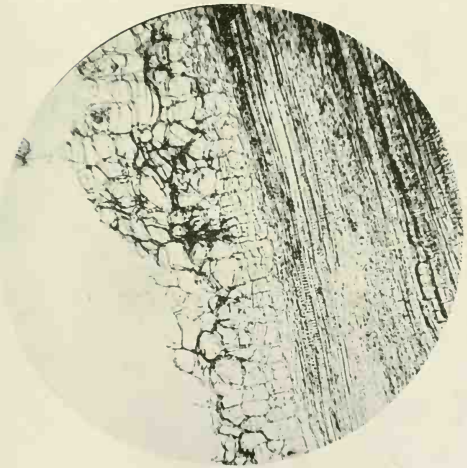


FIG. 6.

O. REID. [*Photo. A. R. Easton.*

OBITUARY NOTICES.

William Evans, 1851–1922.

"He was perhaps the most competent Scottish field naturalist of his day, a man whose sympathies ranged over the whole field of wild life and whose knowledge was equally precise concerning the animals and the plants of the country-side from the lowest to the highest orders."

The words are those of one who knew him well, and had it not been that the appreciation of William Evans from the pen of Dr. Ritchie turns mainly and naturally on the zoological side, I should have transcribed it entire and untouched to these pages of Botanical Transactions.[1]

Yet in Botany, as in Zoology, William Evans was a man of wide interests, not confining himself to any single group of plants, but making himself thoroughly acquainted with all, possessing, indeed, an intimate knowledge of the lower as well as of the higher forms.

The love of plants had an opportunity to develop early, for it was in the atmosphere of the garden that William Evans spent his youngest days. His father, William Wilson Evans, was Curator of the Caledonian Horticultural Society's Experimental Garden in Inverleith Row, Edinburgh, which was later absorbed in the Royal Botanic Garden, and there William Evans, the second youngest of a family of six, was born on 9th May 1851. His early years in the old Experimental Garden were followed by boyhood spent in an environment close to Nature. With his father at Tynefield Farm, near East Linton, whither he had removed in 1857, and later with his uncle at Buckstone Farm, near Mortonhall, the boy came into touch with those influences which seem to have determined the nature and character of his life-work. Before he was ten years of age, he had expressed his interest in bird life in a series of miniature models of birds cut with his pen-knife in wood and painted in colours with his own brush. As a boy, this making of models was one of his favourite occupations. The subjects of his study varied, but in every case there is expressed at this early age that intense devotion

[1] "William Evans, F.R.S.E.," by James Ritchie. The Scottish Naturalist, 1922, pp. 169–173.

to accuracy and detail which marked every piece of work Mr. Evans performed.

About the age of sixteen or seventeen he was still at Edinburgh Institution, walking there every day from his uncle's farm, where he was residing at the time. He left school to join the Scottish Widows' Fund, and it was at the commencement of this professional career that he attended Professor John Hutton Balfour's botany class which met at the Botanic Garden at 8 a.m. The walk from Buckstone had to be accomplished before that early hour of meeting, and work in the laboratory was followed by professional duties in the office. Long walks became so much a habit in Evans' young life that after leaving Buckstone to take up residence in Edinburgh, he climbed Arthur's Seat every evening in order that he might feel he had had exercise for the day. Until ill-health compelled him to retire in 1892, Mr. Evans devoted himself wholeheartedly to his actuarial work, becoming a Fellow of the Faculty of Actuaries and publishing several important papers on actuarial science.

But the naturalist was dominant within him, and from 1880, when he was elected a Fellow of the Royal Physical Society, there appeared from his pen a steady stream of records and observations, all alike stamped with characteristic care and precision. John Hutton Balfour early recognised his worth and recommended Evans for election as an Associate of the Botanical Society of Edinburgh when he was no more than twenty years of age. That honour remained dear to him; he preferred it to ordinary membership, even though it debarred him from occupying the presidential chair which would have been his had the rule allowed. Other honours fell to him. Of the Royal Physical Society he became in turn Secretary, Vice-President, and President. Of the Royal Society of Edinburgh he was elected a Fellow in 1884, and for many years he shared the duties and responsibilities of editing The Scottish Naturalist, while its forerunner, The Annals of Scottish Natural History, owed much to his constant help and advice.

The years of retirement made possible that open-air life which sufficiently restored his health to allow the prosecution of those field studies which lay to his heart. Scottish Natural History has had few more devoted or more enthusiastic students, and few have equalled him in his painstaking search

after facts. His published papers run to well over 100, while short notes exceed 500 in number. Running through this long and extensive series of publications there is a guiding and connecting thread, for the aim of the author was a complete faunal survey of the area of the Forth—an area which William Evans made peculiarly his own, becoming the acknowledged authority on the animal life of the district. In his presidential address on "Our Present Knowledge of the Fauna of the Forth Area," delivered in 1906 to the Royal Physical Society, he summarised the species of animals known to occur in the district, giving the total number as 6865, of which he had met with no fewer than 4250 in the course of his own investigations.

His botanical papers were relatively few in number, and most of them have appeared in the Transactions of our Society. He did not count himself a botanist—such was his great modesty—yet he knew his plants well, both phanerogams and cryptogams. Mosses and Hepatics interested him especially, and the Ricciae of the Edinburgh District were dealt with in a paper published in Trans. Bot. Soc. Edin., 1907. Mosses and Hepatics from the Isle of May were recorded in 1908, with additions in 1910, while a long paper giving moss records for Selkirk, Peebles, and the Lothians was published in 1917. A further contribution in 1921 dealt with mosses from St. Kilda. His last public appearance was at a meeting of the Society on 18th May 1922, when he read a note on the occurrence of *Anthoceros punctatus*, L., in West Lothian, hitherto unrecorded from that county. Even during his last illness his interest in natural history continued to the very end, and he had in hand numerous zoological and botanical studies, including a list of the larger fungi of the Edinburgh district.

With a wealth of information at his disposal, William Evans was ever ready to help, and, so close is the web of life, his expert knowledge was often of the utmost value on such economic matters of importance as the insect pests of timber and other inter-relationships in the world of living things. To the younger man in need of help or in search of information there was always extended that warm welcome which made him feel encouraged to carry on; and pervading all was that extreme modesty so distinctive of the man at all times. Such men are few, and the death of William Evans on Monday, 23rd October 1922, leaves a blank in our ranks which will be

difficult to fill, for the school of Scottish Field Naturalists to which he belonged is fast disappearing. He was among the last, but his name will always be remembered among the most eminent. J. R. MATTHEWS.

SIR ISAAC BAYLEY BALFOUR.

We have to deplore the loss of our most distinguished member, the ornament of our Society, the one who has done most for it. He was never outwith its circle. His father, Professor John Hutton Balfour, was one of the founders of the Society, and the son became a member at the age of nineteen, in May 1872. But his association with it was earlier than that date. His trend to botany was evinced in his boyhood, and his acquaintance with botany and with botanists was inevitable in his environment. The year of admission to the Society was that of his first contributions to its Transactions. He read in 1872 two papers: "Notice of New Localities for Plants near Edinburgh," and "Localities for Plants near Edinburgh." At first hand from his father he had the history of the early days of the Society and of the interesting circle of scientists who laid so well its foundations. In losing him we feel we have lost the last link which connects us with the inception of our Society, which is now rapidly nearing its centenary.

While thus mourning one who loomed so large in the annals of our own Society we have as botanists, as horticulturists, as arboriculturists to lament the passing of one who made a great figure in the wide field outside our own special activities as a Society. I do not propose to enumerate his works nor to sketch his career. With the broad outlines of these we are all more or less familiar. Appreciations more or less detailed have already appeared in scientific and other journals. What I thought more in keeping with this occasion, had time permitted, was to elicit from our members their own recollections, their own impressions, their own opinions of what he represented to them.

As in the old saying—the child was father of the man. Genius, according to some, is the capacity for taking pains. When inclined to nod assent to such a facile generalisation

Photo by] [*W. Crooke.*

PROFESSOR SIR ISAAC BAYLEY BALFOUR.

we are faced with exceptions which raise the question afresh. Here we have the record of a youth scarcely out of his teens, an Arts Graduate, a Science Graduate, a Vans Dunlop scholar, a member of the Transit of Venus Expedition, a medical student who during his father's illness conducts the Botanical Classes with entire responsibility, and is never put out of his stride, graduates in Medicine in due course, without haste, without rest, and far did he travel. Such a one comes almost fully panoplied—no mere gift of taking pains. I do not know that he was addicted to taking pains in the narrow sense, his mind was a solvent of power with keen insight and driving force.

He was gifted with a sound constitution. I confess I knew him not in his prime, not till the middle "forties." But an excursion to a Highland Ben with Balfour in the closing years of last century was a thing to be remembered. Like his brother botanist Trail, he led the way at the pace and with the endurance of a hill shepherd. What corner of Scotland did he not traverse, and what a vivid recollection of the exact locality of the wanted species! And this was no mere record of isolated facts which he kept in store, but a picture of the grouping, of the relationships, to which a detailed study of the ecology could add but little. From his tours abroad he brought the same complete conspectus, the facts seemed mirrored in his brain, the individual plants were all linked in their associations.

His advent on the scene was at a happy hour for Botany. The whole science was in process of change. The old conception of a great botanist was one who knew the Latin names of many plants. The age of aridity of systematic Botany in its least alluring guise was rapidly disappearing. The botanist was previously in danger of becoming a traditional type—what Schleiden satirised as a merchant of Latin and a collector of dried hay. Balfour's acquaintance with the older school was profound. From it he took what was best, but it never dominated his outlook. It gave him instead one more angle from which to view the broad expanse of nature's workings. His association in early years with Strasburger, with Sachs, with de Bary was of great moment in his fashioning. It led him to the establishment of the Laboratory as the essential scientific need of the day. He was a great

lecturer, but he was not induced by his facility there to overestimate the importance of the *ex cathedra* discourse. The practical class, formerly an optional excrescence, became the chief of his weapons. With what unfailing assiduity did he pursue his goal! With now and again a set-back, his persistence gave us what is probably the best-equipped botanical Laboratory in these isles. And his teaching developed *pari passu*.

Susceptible to all the new influences, retentive of what was best in the old, he took his course amidst the changes of his eventful epoch with a sure and steadfast sanity. He was never lost in mere detail. He was ever seeking the thread which was to prove the guide through the maze. He was an exponent of the *big things* of his science, for he was of the breed of the great generalisers. And not of those who generalise before they have been through the mill in which details are ground. Darwin had the broad outlook, but he served his apprenticeship at "minutiæ," nor was that training lost. So Balfour in his Rhododendron papers saw deep, noted much of what might seem trivial distinctions, but he always came back to the wide survey. It was in this aspect that he appealed so much to his fellow-botanists. He was the Mentor—the Master of the Craft, if you like—to his botanical peers. It was a unique position. Some have published more, others may have made more profound discoveries, others proved "best sellers" in their lucid expositions, but amidst them all—it was, What does Balfour think of it? There was a clarity of judgment, an appreciation of evidence, a sanity too strong to be swayed by the "new thing" of the hour. And so it was that he who published much came to him for advice, that he who travelled much came for confirmation of his generalisations, that he who discovered much came to discuss the effect and bearings of what he had found on what was known.

An enormous worker, he taxed his own good constitution to the uttermost. When engaged on a task which held his interest his ardour was extreme. Even in his failing years he held on, often for nights on end, till one, two, and three in the morning. Absorbed in his specimens, he was oblivious of time. Even to eye-fatigue he seemed impervious. It was always with him "more light." The number of lamps and

their high power were ever a source of protest and professional dismay to the officials who superintend these matters for the Government service. His workroom was "engined" like a submarine and usually a mass of specimens and paper. I think as he grew older his *ingenium perfervidum* grew greater. I confess I never knew any of us who could attempt to keep pace.

He had a Spartan devotion to duty. Illness or fatigue rarely caused him to stay his hand. A little more indulgence to himself, acquiescence in a little lower standard in the execution of his duties, these would have saved us the regret of his sudden passing. But that was not his way. Work or play, he was out to win, and no half-measures. If he exacted fair measure from his staff, he took over-measure upon himself. We have in this world our schools and schoolmasters, and as we survey the road we have travelled, our minds, and our hearts, do not dwell with happy memories on those who let us do as we liked, but rather far on those who held us to the course and knew us for what we were.

His works are an enduring monument of his possession of the useful qualities of force and tact. Short as was his time at Glasgow, he left his mark on both Laboratory and Botanic Garden. Short as was his period at Oxford, he saw the rejuvenescence of the Oxford Botanic Garden and the establishment of the Annals of Botany. He returned to Edinburgh in 1888. In the face of many adverse conditions, such as financial stringency in the matter of Government support, especially in the earlier years, he has transformed the place. Step by step, by tactful persistency, he has established the laboratories, extended the grounds, rebuilt the plant-houses. He has left the Edinburgh Botanic Garden as a Mecca of the Horticulturist. To many who knew him not as a botanist he appealed as a distinguished exponent of the gardening craft. His acquaintance with the plants of cultivation, his exact knowledge of their origin and how they came to the Botanic Garden, his experience of their needs and treatment would have served as more than adequate equipment for a curator who had spent his days on little else.

These notes are of too brief compass to permit of reference to all his other activities. His many students may prefer to recall him as he showed himself, vasculum on shoulder,

at a hill excursion, eager to make the most of a day in the open. On such occasions he revelled in anecdote and reminiscence as the party made their way homeward. He was full of humour, with much appreciation of the "Doric."

When he retired he asked no other boon than the strength to go on working. In spite of rapidly failing health he pursued his labours without ceasing. *Nulla dies sine linea.* When the need arose it did not seem possible to one of his temperament to husband his energies, and existence without the stimulus of hard work made no appeal to him. The members of this Society who knew him so well and who now have lost his fellowship will ever retain vivid memories of his personality, and will ever appreciate the aptness of the reference made to him by another pen—"the friend and counsellor of all that is best in British Botany."

W. Wright Smith.

ROLL

OF

THE BOTANICAL SOCIETY OF EDINBURGH.

Corrected to September 1923.

Patron:

HIS MOST GRACIOUS MAJESTY THE KING.

HONORARY FELLOWS.

BRITISH SUBJECTS (LIMITED TO SIX).

Date of Election.

June 1923. DRUCE, G. CLARIDGE, M.A., LL.D., 9 *Crick Road, Oxford.*

Nov. 1888. DYER, Sir WILLIAM TURNER THISELTON, M.A., LL.D., K.C.M.G., C.I.E., F.R.S., *The Ferns, Witcombe, Gloucestershire.*

Dec. 1907. FARMER, J. BRENTLAND, M.A., D.Sc., F.R.S., *Professor of Botany, Imperial College of Science and Technology, S. Kensington.*

June 1923. PRAEGER, R. LLOYD, B.A., D.Sc., *National Library of Ireland, Kildare Street, Dublin.*

June 1923. RENDLE, A. B., M.A., D.Sc., F.R.S., 28 *Holmbush Road, Putney, London, S.W.* 15.

Feb. 1912. SCOTT, Dr. D. H., M.A., LL.D., Ph.D., F.R.S., *East Oakley House, Basingstoke, Hants.*

FOREIGN (LIMITED TO TWENTY-FIVE).

June 1902. BRITTON, NATHANIEL LORD, *Director of the Botanic Garden, New York.*

June 1923. CAMPBELL, Dr. DOUGLAS HOUGHTON, *Professor of Botany, Stanford University, California;—Corresponding Member, Dec.* 1905.

June 1923. CHODAT, Professor Dr. ROBERT, *L'Université, Geneva.*

June 1923. COULTER, JOHN MERLE, *Professor of Botany, University of Chicago;—Corresponding Member, Dec.* 1905.

Feb. 1911. FLAHAULT, Dr. CHARLES, *Professor of Botany to the Faculty of Science, and Director of the Institute of the University, Montpellier.*

June 1923. IKENO, Professor SEITTSIRO, Ph.D., *Agricultural College, Imperial University, Tokio.*

June 1923. LECOMTE, Professor HENRI, *Muséum d'Histoire Naturelle, Paris.*

June 1923. LOTSY, Dr. J. P., *Spaarne* 17, *Haarlem.*

June 1923. MACDOUGAL, Dr. D. T., *Director of Department of Botanical Research, Carnegie Institution, Tucson.*

Date of Election.

June 1923. MASSART, Professor JEAN, *Directeur de l'Institut Botanique Léo Errera, Brussels.*

June 1923. OSTENFELD, Dr. C. H., *Professor of Botany and Director of the Botanic Garden, Copenhagen.*

June 1923. OSTERHOUT, W. J. V., Ph.D., *Professor of Botany, Harvard University, Cambridge, Mass.*

Mar. 1895. SARGENT, CHARLES S., *Professor of Arboriculture and Director of the Arboretum, Harvard ;—Corresponding Member, March* 1878.

June 1923. THAXTER, Professor ROLAND, Ph.D., 7 *Scott Street, Cambridge, Mass.*

June 1902. TRELEASE, Dr. WILLIAM, *University of Illinois, Urbana, Illinois, U.S.A.*

Mar. 1895. VRIES, Dr. H. DE, *Professor of Botany in the University, Amsterdam.*

Dec. 1885. WARMING, Dr. EUGENE, For.M.L.S., *Emeritus-Professor, Copenhagen.*

June 1923. WILLE, Dr. J. N. F., *Professor in the University and Director of the Botanic Garden, Christiania.*

June 1923. WILSON, E. H., *Arnold Arboretum, Jamaica Plain, Mass.*

RESIDENT AND NON-RESIDENT FELLOWS.

No distinguishing mark is placed before the name of Resident Fellows who contribute annually and receive Publications.

* *Indicates Resident Fellows who have compounded for Annual Contribution and receive Publications.*

† *Indicates Non-Resident Fellows who have compounded for Publications.*

‡ *Indicates Non-Resident Fellows who do not receive Publications.*

Date of Election.

Dec. 1915. Adam, Robert Moyes, 17 *W. Brighton Crescent, Portobello.*

Feb. 1905. †Aiken, Rev. J. J. Marshall Lang, B.D., *The Manse, Ayton, Berwickshire.*

Nov. 1884. †Alexander, J. A., *Waverley, Rossmore Avenue, Parkstone, Dorset.*

Nov. 1914. Alexander, J. H., 8 *Chamberlain Road, Edinburgh.*

Dec. 1908. ‡Balfour, F. R. S., M.A., 39 *Phillimore Gardens, Kensington, London, W.*

Jan. 1905. *Bell, A. C. M., W.S., 4 *Randolph Place, Edinburgh.*

May 1891. *Berwick, Thomas, 56 *North Street, St. Andrews.*

Feb. 1919. †Blackburne, Cecil Ireland, Esq., *Valence, Westerham, Kent.*

May 1888. *Bonnar, William, 51 *Braid Avenue, Edinburgh.*

Jan. 1899. *Borthwick, A. W., O.B.E., D.Sc., 22 *Grosvenor Gardens, London, S.W.* 1.

Dec. 1886. *Bower, F. O., M.A., D.Sc., F.R.S., F.L.S., *Professor of Botany, University of Glasgow,* 1 *St. John's Terrace, Hillhead, Glasgow.*

Feb. 1870. †Bramwell, John Milne, M.D., "*The Hove,*" *Furze Hill Road, Torquay.*

April 1913. ‡Brebner, James, 2 *Scotswood Terrace, Dundee.*

Dec. 1906. †Bryce, George, D.Sc., *Rabaul, New Guinea.*

Nov. 1922. Buchanan, E. M., 9 *Strathfillan Road, Edinburgh.*

Nov. 1894. Buchan-Hepburn, Sir A., Bart., *Smeaton Hepburn, Prestonkirk.*

Dec. 1921. ‡Burns, W., D.Sc., *Bombay Agric. Dept., Poona, Bombay, India.*

Dec. 1915. Cadman, Miss Elsie, M.A., B.Sc., 19 *Rutland Square, Edinburgh.*

Feb. 1882. Caird, Francis M., M.B., C.M., F.R.C.S.Ed., *Professor of Clinical Surgery,* 13 *Charlotte Square, Edinburgh,*—ARTIST.

Nov. 1905. Campbell, Robt., M.A., D.Sc., *Geological Department, University of Edinburgh.*

Nov. 1922. Chalmers, Miss Agnes, B.Sc., 9 *Montpelier Park, Edinburgh.*

June 1873. *Clark, T. Bennet, C.A., *Newmills, Balerno.*

Dec. 1856. †Cleland, John, M.D., F.R.S., *Drumclog, Crewkerne, Somerset.*

May 1861. ‡Coldstream, Wm., B.A., I.C.S. (retd.), 69 *West Cromwell Road, London, S.W.*

April 1913. ‡Cooper, R. E., *Govt. Botanic Garden, Maymyo, Burma.*

Mar. 1900. *Cowan, Alexander, *Valleyfield, Penicuik.*

Feb. 1923. †Cox, E. H. M., 34 *Margaret Street, London, W.* 1.

Dec. 1915. *Craib, W. G., M.A., *Professor of Botany, Aberdeen.*

Dec. 1903. Davidson, J. Randolph, M.A., B.Sc., *School of Agriculture, Gizeh, Egypt.*

Dec. 1911. ‡Davidson, John, *Assistant Professor of Botany, University of British Columbia, Vancouver, Canada.*

Date of Election.

Dec. 1892. Day, T. Cuthbert, F.I.C., 36 *Hillside Crescent, Edinburgh.*
April 1914. Dodd, A. Scott, B.Sc., 20 *Stafford Street, Edinburgh.*
Nov. 1919. *Downie, Miss D. G., B.Sc., 1 *W. Stanhope Place, Edinburgh.*
May 1921. Drummond, J. Montagu F., B.A., F.L.S., *Director, Plant Breeding Station, Corstorphine.*
Dec. 1859. †Duckworth, Sir Dyce, Bart., M.D., LL.D., 28 *Grosvenor Place, London, S.W.*
Feb. 1917. †Eley, Charles, *East Bergholt Place, Suffolk.*
Nov. 1885. Elliot, G. F. Scott, M.A., B.Sc., F.L.S., *Drumwhill, Mossdale.*
Jan. 1883. *Evans, Arthur H., Sc.D., 9 *Harvey Road, Cambridge.*
Dec. 1905. *Evans, W. Edgar, B.Sc., 38 *Morningside Park, Edinburgh.*
Mar. 1890. Ewart, J. Cossar, M.D., F.R.SS. L. & E., *Professor of Natural History, University of Edinburgh.*
Feb. 1873. *France, Charles S., 13 *Cairnfield Place, Aberdeen.*
Jan. 1906. *Fraser, James, 18 *Park Road, Leith.*
July 1872. *Fraser, John, M.B., C.M., 54 *Great King Street, Edinburgh.*
Oct. 1920. *Galloway, R. Angus, M.C., B.Sc., 1 *Riselaw Road, Edinburgh.*
Mar. 1871. *Gamble, James Sykes, M.A., F.L.S., *High Field, East Liss, Hants.*
Dec. 1920. †Garriock, John, M.A., B.Sc., *Morgan Academy, Dundee.*
May 1874. ‡Geikie, Sir Archibald, LL.D., F.R.SS. L. & E., *Shepherd's Down, Haslemere, Surrey.*
Jan. 1887. *Gibson, A. H., 28 *Dalhousie Terrace, Edinburgh.*
May 1903. ‡Gilmore, Dr. Owen, L.R.C.P., L.R.C.S.E., 49 *Acre Lane, Brixton, London, S.W.*
Dec. 1907. Gourlay, Dr. W. Balfour, M.C., 7 *Millington Road, Cambridge.*
Nov. 1921. *Graham, R. J. D., M.A., D.Sc., *Dunalastair, North Inch, Perth.*
Jan. 1889. *Grieve, James, *Redbraes Nurseries, Broughton Road, Edinburgh.*
Jan. 1922. *Gray, Miss Helen I. Allan, M.A., B.Sc., 107 *Ferry Road, Leith.*
Mar. 1923. Gray, John H., M.A., B.Sc., 28 *Gillespie Crescent, Edinburgh.*
Dec. 1895. *Grieve, Sommerville, 21 *Queen's Crescent, Edinburgh.*
Feb. 1879. *Grieve, Symington, 11 *Lander Road, Edinburgh.*
Dec. 1921. Guyer, R. Glode, 167 *Mayfield Road, Edinburgh.*
Nov. 1919. Hamilton, Ferguson, M.A., 14 *Spottiswoode Street, Edinburgh.*
Nov. 1914. ‡Harley, Andrew, *Blinkbonny, Kirkcaldy.*
April 1910. Harvey, Miss Elsie, 12 *Addison Terrace, Victoria Park, Manchester.*
Mar. 1913. †Hayward, Miss Ida M., F.L.S., 7 *Abbotsford Road, Galashiels.*
April 1886. Hill, J. Rutherford, Ph.C., *Secretary, Pharmaceutical Society,* 36 *York Place, Edinburgh.*
Feb. 1878. †Holmes, E. M., F.L.S., F.R.H.S., *Curator of Museum, Phar. Soc. of Great Britain, Ruthven, Sevenoaks, Kent.*
Mar. 1920. Howison, Andrew, M.A., B.Sc., 18 *Beresford Avenue, Leith.*
Feb. 1891. ‡Jamieson, Thomas, 10 *Belmont Street, Aberdeen.*
Dec. 1907. *Jeffrey, J. Frederick, *Redcroft, Redhill, Wrington, Somerset.*
Mar. 1905. †Joannides, Pericles, B.Sc., *Sporting Club, Ibrahimieh, Alexandria, Egypt.*
Dec. 1921. Johnston, Charles S. S., *Erneston, Boswall Road, Edinburgh.*
May 1877. *Johnston, Henry Halcro, C.B., C.B.E., D.Sc., M.D., F.L.S., *Colonel R.A.M.C., Mackay's Hotel, Stromness, Orkney.*
Dec. 1912. *Johnstone, James Todd, M.A., B.Sc., *Royal Botanic Garden, Edinburgh.*
Jan. 1913. *Kemp, Mrs. C. Norman, M.A., D.Sc., *Ivy Lodge, Lavcrockbank Road, Leith.*
Oct. 1922. *King, David, F.R.H.S., *Osborne Nursery, Corstorphine Road, Edinburgh.*
Oct. 1921. King, Miss Isabella M., B.Sc., 4 *Cambridge Gardens, Edinburgh.*
Nov. 1921. *Laing, Ernest V., M.A., B.Sc., 13 *Argyll Crescent, Aberdeen.*
Dec. 1911. *Lamont, Miss Augusta, 73 *Falcon Road, Edinburgh.*
Jan. 1914. Latimer, Sydney, 2 *Hermitage Gardens, Edinburgh.*
Dec. 1917. Law, Mrs. John, 41 *Heriot Row, Edinburgh.*
Feb. 1888. ‡Learmonth, Wm., *Fleetview, Gatehouse of Fleet.*
Feb. 1878. ‡Lennox, David, M.D., F.C.S., *Ruddon Grange, Elie, Fife.*
Dec. 1922. *Lewis, Herbert M., B.Sc., *Penucha, Caerwys, N. Wales.*
Nov. 1922. ‡M'Call, David, B.Sc., Ph.D., *Dundee Technical College, Bell Street, Dundee.*
April 1920. ‡MacCallum, Mrs. B. D., M.A., D.Sc., 149 *Morningside Road, Edinburgh.*

Date of Election.

Jan. 1895. MacDougall, R. Stewart, M.A., D.Sc., 9 *Dryden Place, Edinburgh.*
Jan. 1881. †Macfarlane, John M., Sc.D., F.R.S.E., *Emeritus-Professor of Botany,* 4320 *Osage Avenue, Philadelphia, Pa.*
Feb. 1886. M'Glashan, D., 11 *Corrennie Gardens, Edinburgh.*
June 1880. *M'Intosh, W. C., M.D., LL.D., F.R.SS. L. & E., F.L.S., 2 *Abbotsford Crescent, St. Andrews.*
June 1897. †Macvicar, Symers M., *Invermoidart, Acharacle, Argyllshire.*
Feb. 1914. Macwatt, John, M.B., C.M., *Morelands, Duns.*
Dec. 1896. ‡Mahalanobis, Professor S. C., B.Sc., F.R.S.E., *Presidency College, Calcutta.*
Oct. 1914. *Martin, Isa, M.A., 69 *Arden Street, Edinburgh.*
Jan. 1902. Massie, William Hall, *Redbraes House, Broughton Road, Edinburgh.*
Mar. 1913. *Matthews, James R., M.A., *Royal Botanic Garden, Edinburgh,*—HONORARY SECRETARY.
Dec. 1916. †Maxwell, Sir John Stirling, Bart., 1 *Park Gardens, Glasgow.*
Feb. 1902. *Millar, R. C., C.A., 6 *Regent Terrace, Edinburgh,*—AUDITOR.
April 1919. ‡Mills, A. E., 8 *George Street, Bath.*
Mar. 1922. Moncur, David, M.A., B.Sc., 24 *Hillside Crescent, Edinburgh.*
Jan. 1899. Morton, Alex., B.Sc., 23 *Morningside Grove, Edinburgh.*
July 1878. †Muirhead, George, F.R.S.E., *Gordon Estates Office, Fochabers.*
Oct. 1918. †Murray, J. M., B.Sc., 25 *Drumsheugh Gardens, Edinburgh.*
April 1916. †Nicholson, C., Esq., F.E.S., 35 *The Avenue, Hale End, Chingford, Essex.*
Feb. 1894. Novar, The Rt. Hon. Viscount, G.C.M.G., *of Raith and Novar, Kirkcaldy.*
Dec. 1907. *Orr, Matt. Y., *Royal Botanic Garden, Edinburgh.*
Oct. 1914. †Patton, Donald, Ph.D., M.A., B.Sc., 9 *Thornwood Gardens, Broomhill, Glasgow.*
April 1883. *Paul, Very Rev. David, M.A., LL.D., D.D., *Carridale, Fountainhall Road, Edinburgh,*—FOREIGN SECRETARY.
Nov. 1919. Pealling, Robert J., M.A., B.Sc., *The Royal Academy, Inverness.*
April 1887. Peyton, Rev. W. W., *Braeriach, Tan-y-Bryn Road, Llandudno, Wales.*
Nov. 1921. Phillips, John F. V., B.Sc., *Forest Research Station, Deepwalls, Knysna, C.P., South Africa.*
Dec. 1917. *Pike, J. Lyford, B.Sc., *Rosetta, Liberton.*
Jan. 1915. *Pinkerton, A. A., *Adele Cottage, Loanhead.*
June 1891. †Prain, Sir David, M.D., C.I.E., F.R.SS. L. & E., F.L.S., 12 *Heathview Gardens, Putney Heath, London, S.W.* 15.
July 1884. *Rattray, John, M.A., B.Sc., F.R.S.E., *Tullyburn Terrace, Glasgow Road, Perth.*
April 1877. ‡Riddell, Wm. R., B.A., B.Sc. (Hon. Mr. Justice), *Osgoode Hall, Toronto, Canada.*
Dec. 1869. *Robertson, A. Milne, M.B., C.M., *Hawea, Rodway Road, Roehampton, London, S.W.*
Dec. 1890. Robertson, Robert A., M.A., B.Sc., *Lecturer on Botany, Bute Medical School, St. Andrews.*
Jan. 1923. †Rollo, Hon. Bernard F., *Keltie Castle, Dunning.*
Feb. 1905. *Ross, A. J., M.A., B.Sc., *Schoolhouse, Gretna.*
Mar. 1902. Sampson, Hugh C., B.Sc., *The Riding, Riding Mill on Tyne, Northumberland.*
Dec. 1922. Seaton, Ian W., B.Sc., *Plant Breeding Division, Ministry of Agriculture, Belfast.*
Dec. 1887. ‡Scott, J. S., L.S.A., 69 *Clowes Street, West Gorton, Manchester.*
June 1922. †Simpson, J. R., *The Limes, Selkirk.*
Dec. 1922. Smith, Miss Edith Philip, B.A., F.L.S., 46 *Murrayfield Drive, Edinburgh.*
Feb. 1891. *Smith, J. Pentland, M.A., B.Sc., *Carnbie, Bridge of Weir, Renfrewshire.*
Nov. 1914. *Smith, James L. S., M.A., B.Sc., 17 *Cargill Terrace, Edinburgh.*
Dec. 1917. †Smith, J. T., 68 *Tennant Street, Glasgow.*
Dec. 1909. Smith, Wm. G., B.Sc., Ph.D., 9 *Braidburn Crescent, Edinburgh.*
Jan. 1902. *Smith, Professor W. Wright, M.A., *King's Botanist, Regius Keeper, Royal Botanic Garden, Edinburgh.*
Jan. 1890. *Somerville, William, Œc.D., B.Sc., F.R.S.E., *Sibthorpian Professor of Rural Economy,* 121 *Banbury Road, Oxford.*
Oct. 1914. †Stewart, Edward J. A., M.A., B.Sc., 8 *Manor Road, Jordanhill, Glasgow.*

Date of Election.

Oct. 1918. †Stewart, Capt. William, *Shambellie, Kirkcudbright.*
April 1921. Sutherland, John, C.B.E., 11 *Inverleith Row, Edinburgh.*
Feb. 1902. Tagg, Harry F., F.L.S., *Royal Botanic Garden, Edinburgh.*
Jan. 1913. ‡Tagg, M. H., 53 *Clayton Avenue, Wembley, Middlesex.*
Dec. 1922. Taylor, George Crosbie, B.Sc., 15 *Broughton Place, Edinburgh.*
May 1923. †Taylor, R. A., M.A., B.Sc., *Culloden Estates, Neboda, Ceylon.*
Dec. 1887. Terras, J. A., B.Sc., 40 *Findhorn Place, Edinburgh.*
April 1921. †Thompson, J. MacLean, M.A., D.Sc., F.L.S., *Professor, Department of Botany, University, Liverpool.*
Jan. 1909. Thompson, Miss Jean G., B.Sc., 19 *Pentland Terrace, Edinburgh.*
Dec. 1888. Turnbull, Robert, B.Sc., 43 *Windsor Road, Rathmines, Dublin.*
Nov. 1922. *Urquhart, Mrs. Douie, 42 *India Street, Edinburgh.*
July 1886. †Waddell, Alexander, *of Palace, Jedburgh.*
Nov. 1921. Walker, Miss Marion, M.A., 12 *Chancelot Terrace, Edinburgh.*
Oct. 1918. †Watson, Harry, 6 *Hyndford Street, Dundee.*
Nov. 1921. *Watt, Miss Janet, 6 *W. Catherine Place, Edinburgh.*
Feb. 1901. Whytock, James, 15 *W. Savile Road, Edinburgh.*
Dec. 1922. Wilson, Miss Dorothy G., B.Sc., 54 *E. Claremont Street, Edinburgh.*
Feb. 1912. Wilson, Malcolm, D.Sc., *Breutknoll, Kinnear Road, Edinburgh.*
Mar. 1909. *Wilson, Thos., Ph.C., 110 *High Street, Burntisland.*
May 1873. ‡Wright, Professor R. Ramsay, M.A., B.Sc., *Red Gables, Headington Hill, Oxford.*
Jan. 1903. Young, William, *Fairview, Kirkcaldy.*
Jan. 1923. *Younger, Harry Geo., 21 *Grosvenor Crescent, Edinburgh.*

ORDINARY MEMBERS.

Nov. 1922. Abernethy, Miss H. C., B.Sc., 3 *Marchmont Crescent, Edinburgh.*
Nov. 1922. Burt, Miss C. C., 20 *Buccleuch Place, Edinburgh.*
Nov. 1910. Clark, Mrs. Bennet, *Newmills, Balerno.*
Nov. 1921. Dalmahoy, Miss Esme, 13 *Buckingham Terrace, Edinburgh.*
Nov. 1910. Grieve, Miss Jean E., 11 *Lauder Road, Edinburgh.*
Nov. 1922. Henderson, Miss E. M., M.A., B.Sc., 8 *Churchhill, Edinburgh.*
May 1921. Jardine, Miss Gertrude, 26 *Murrayfield Road, Edinburgh.*
Nov. 1922. Knagg, Miss M. M. B., B.Sc., c/o *Thorburn*, 20 *Rankeillor Street, Edinburgh.*
Nov. 1922. Massey, Miss K., B.Sc., *Glenanore, Disley, Cheshire.*
Nov. 1922. Wilson, Miss M. J. F., *Masson Hall, George Square, Edinburgh.*

ASSOCIATES.

Mar. 1886. Bennett, A., A.L.S., 5 *Thanet Place, High Street, Croydon.*
Jan. 1906. Harrow, R. L., *Royal Botanic Garden, Edinburgh.*
Feb. 1919. Johnson, Norman M., B.Sc., *Kinglassie Schoolhouse, near Cardenden, Fife.*
Dec. 1883. Richardson, Adam D., 19 *Joppa Road, Portobello, Midlothian.*
Jan. 1906. Stewart, L. B., *Royal Botanic Garden, Edinburgh.*

LADY MEMBERS.

June 1893. Aitken, Mrs. A. P., 15 *Victoria Mansions, West Hampstead, London, N.W.*
April 1893. Balfour, Lady Bayley, *Courts Hill, Haslemere, Surrey.*
Feb. 1910. Galletly, Mrs. Sarah H., 71 *Braid Avenue, Edinburgh.*
April 1902. Grieve, Mrs. Symington, 11 *Lauder Road, Edinburgh.*

CORRESPONDING MEMBERS.

Dec. 1905. Beijerinck, M. W., *Professor of Bacteriology, Delft.*
July 1879. Cheeseman, T. F., F.L.S., F.Z.S., *Curator of the Museum, Auckland, New Zealand.*
Dec. 1905. Cockayne, L., Ph.D., F.R.S., F.L.S., *Ngaio, Wellington, New Zealand.*
June 1902. Constantin, Dr. J., *Professeur au Muséum d'Histoire Naturelle, Paris.*

Date of Election.

Mar. 1895. Elfving, Dr. Fredrik, *Professor of Botany in the University, and Director of the Botanic Garden, Helsingfors.*

Dec. 1905. Fawcett, William, B.Sc., F.L.S., 76 *Shooter's Hill Road, Blackheath, London, S.E.*

Dec. 1905. Gravis, Auguste, *Professor at the University, and Director of the Botanic Garden, Liége.*

Mar. 1895. Guignard, Léon, *Membre de Institut, Rue du Val-de-Grâce* 6, *Paris.*

June 1902. Henriques, Julio A., *Professor of Botany in the University, and Director of the Botanic Garden, Coimbra.*

May 1891. Henry, Augustine, M.A., F.L.S., *Professor of Forestry, Royal College of Science, Dublin.*

June 1902. Maiden, J. H., *Director of the Botanic Garden, Sydney, N.S.W.*

Dec. 1905. Mattirolo, Dr. Oreste, *Professor of Botany in the University, and Director of the Botanic Garden, Torino, Piedmont.*

Dec. 1905. Miyabe, Dr. Kingo, *Professor of Botany, Hokkaido Imperial University, and Director of the Botanic Garden, Sapporo, Hokkaido, Japan.*

June 1902. Miyoshi, Manabu, *Professor of Botany in the Imperial University, Tokio.*

June 1902. Raunkiaer, Professor Christen, *Botanic Museum, Copenhagen.*

Dec. 1905. Rodway, Leonard, *Government Botanist of Tasmania, Hobart.*

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